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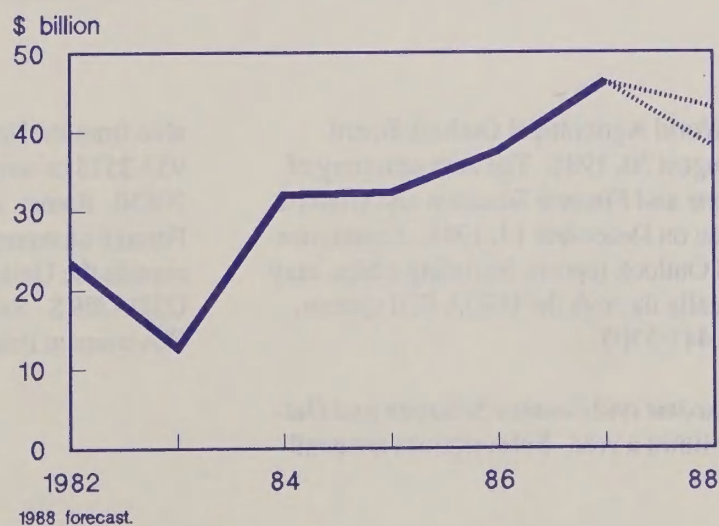
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Agricultural Income and Finance

Situation and Outlook Report

Drought Could Lower Net Farm Income



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ABOUT THIS ISSUE

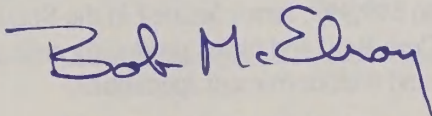
I've received many calls since our May issue came out, all of them complimentary. Two years were spent in planning the expanded, quarterly financial Situation and Outlook report, and it appears the demand is great for more current and more topical financial information.

In this issue the focus is naturally on the drought. The entire Department of Agriculture has spent the last 3 months monitoring and analyzing what is being called the "worst drought since the 1930's." This quarter's *Agricultural Income and Finance Situation and Outlook* looks at who is being affected, what is happening to incomes and why, and what is being done to help those in trouble.

Additionally, we are featuring in-depth State-level data on farm income, assets, and debt. This marks the first time ERS has published most of this information in such detail.

Finally, there is a summary of the financial conditions of U.S. farms as of January 1, 1988. The analysis is based on the Farm Costs and Returns Survey taken this past Spring. A more detailed report will be published soon but you are getting an overview first.

Please note that we are now on a subscription basis. This is the best way to make sure you get each issue as soon as it is released. Information on subscribing is at the bottom of page 2.



REPORT COORDINATOR

SUMMARY

Net farm income for 1988 is forecast at \$38 to \$43 billion, down from last year's \$46-billion high. Net farm income is typically much more volatile than net cash income because weather often causes sharp changes in production that lead to swings in inventory values. Based on August 1 conditions, net cash income could be between \$55 and \$60 billion, about equal to last year's record \$57.1 billion.

Going into the drought, the outlook for crop receipts was much improved over recent years. Substantially reduced wheat and soybean stocks, rising exports, and strong demand from an expanding livestock sector were driving grain prices higher. The drought further boosted the early season price strength. Crop receipts are estimated at \$6 billion above the 1987 level, with half the increase due to the drought.

Livestock receipts, which were rising prior to the drought, are expected to be relatively stable, as following recent droughts. Record-high receipts going into the drought have provided a cushion against rising feed costs and deteriorating pasture conditions. Culling of beef cattle has been only slightly higher than normal, since the five largest cattle producing States (Texas, Nebraska, Kansas, Colorado, and Oklahoma) are outside the hardest hit drought areas. However, dairy cattle slaughter has been heavy in the Northern Plains and the important dairy States of the Great Lakes.

The increase in total receipts and net cash income for 1988 will not be uniform across the Nation. The regional farm income picture largely reflects the geographical distribution of the drought. Net cash income in the South-

central region is expected to increase roughly 10 percent. The Southeast also is expected to do relatively well as its share of corn, wheat, and soybean production rises. Net cash income in the Northeast and the Midwest is expected to remain near 1987 levels.

Even though total income may be stable in most regions, there are likely to be wide disparities within regions as some farmers gain and others lose. The Farm Costs and Returns Survey (FCRS) conducted early this year suggests that 51 percent of all farms are in counties later hit by severe to extreme drought. In extensive portions of the Midwest, 80 to 90 percent of all farms are in severely affected counties. Many farmers in drought counties were already in a weak financial position at the beginning of 1988 and had not fully recovered from the financial difficulties of the early to mid-1980's. These farmers are least able to endure the economic repercussions of the drought. However, recently passed Disaster Assistance Act will help support incomes of hard-hit farmers.

Data from the FCRS show the proportion of farms with debt/asset ratios above .40 fell from 22 percent last year to 15 percent this year. Five percent of all farm businesses were in a vulnerable financial position (negative net farm income and debt/asset ratio above .40) at the beginning of 1988. This was a significant improvement over a year earlier when 10 percent of farms were considered vulnerable. The strongest improvement was for farms with gross receipts of \$40,000 to \$99,999; farms located in the Southern Plains, Delta, and Corn Belt; and farms producing cash grains, vegetables, and fruit or tree nut specialties.

GLOSSARY OF TERMS IN FARM INCOME AND FINANCE

Net cash income—is the difference between cash receipts, farm related income, and direct Government payments and cash expenses. This cash-based concept measures the total income farmers receive in a given year, regardless of the year in which the marketed output was produced. It indicates the availability of funds to cover cash operating costs, finance capital investments and savings, service debts, maintain living standards, and pay taxes.

Net farm income—is the difference between gross farm income and total expenses. This accrual-based concept measures the profit or loss associated with a given year's production. Additions to inventories are treated as income. Nonmoney items such as depreciation, the consumption of farm-grown food, and the net imputed rental value of operator dwellings are included.

Net cash flow—is the sum of: gross cash income, the change in loans outstanding, net rent to nonoperator landlords, and the net change in farmers' currency and demand deposits; minus gross cash expenses and gross capital expenditures. This financial indicator measures cash available to farm operators and landlords in a given year. It

indicates the ability to meet current obligations and provide for family living expenses, and to undertake investments.

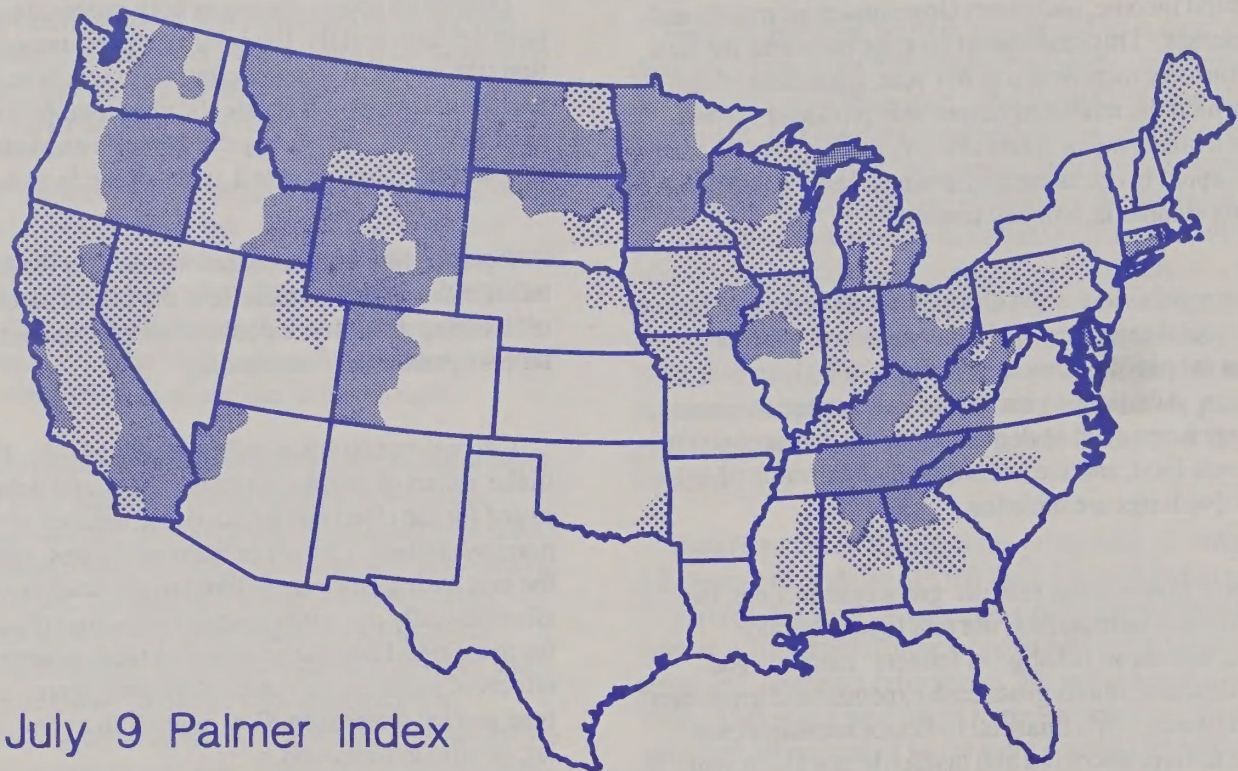
Debt/asset ratio—measures both proportional owner equity in the farm and the financial risk exposure of the operation (the extent to which the farm's assets have been borrowed against). It is calculated as total debt outstanding as of January 1, divided by the farmer's estimate of the current market value of owned assets of the farm business.

Equity level—measures net worth. It is the hypothetical balance that would remain from the sale of assets and paying off existing debt. It is calculated as total operator assets minus operator debt outstanding.

Current and inflation-adjusted dollars—In this report, dollar values of income, expense, asset, and debt items, unadjusted for the effects of inflation, are referred to as current or nominal dollars. Current or nominal figures, which indicate the purchasing power prevailing in the cited year, do not allow for fully accurate comparisons across time. To allow for meaningful comparisons across time, adjustments for the effects of inflation are made. Adjusted figures use a 1982 base and are interchangeably referred to as real, constant dollar, or inflation-adjusted.

Figure 1

Worst Drought in 50 Years



July 9 Palmer Index

Extreme
Severe

FARM INCOME

The Drought and Recent Financial Gains

This year's drought is the most widespread and severe since the 1930's. However, it is occurring following a year of solid financial gains which should help many producers withstand the adverse impacts. Some producers would have been less likely to successfully adjust their finances had the drought occurred just a year or two earlier. At the same time, recent economic progress has been less evident in the regions where the drought is most severe.

Impacts of Recent Droughts on Farm Income

Droughts earlier this decade provide some insight of what to expect this year. In 1980 and 1983, net cash income changed very little from the previous year. Because of inelastic demand for agricultural products in the short term, higher prices compensated for reduced output. In 1980, total crop output fell 11 percent, but was more than offset by higher prices and accelerated inventory reduction. In that year, feed grains, food grains, and oil crops, which were most affected by dry conditions, accounted for the vast majority of the growth in receipts.

In 1983, the combined PIK and drought effects cut crop production 25 percent. Prices rose by a considerably smaller margin, 6 percent, prompting a \$5.2-billion fall in crop receipts. However, the dramatic rise in 1983 direct Federal payments held the decline in net cash income to just over \$1 billion.

Sharply higher production expenses seriously impeded income growth in these earlier drought years. Net farm income, a production-based measure, fell due to reduced yields. In response to production shortfalls, the value of inventory liquidations averaged roughly \$8 billion, while net farm income fell nearly \$11 billion in each drought year. As illustrated in table 1, as production rebounded following the 1980 and 1983 droughts, net farm income rose rather dramatically.

While past droughts provide some indication of income components likely to be affected this year, several key differences exist between then and now. First, this was an early drought beginning in the second quarter, and increased 1988 prices will be in effect for a longer period than for either of the two comparison years. In both 1980 and 1983, drought-related price strength was not established until July, meaning one less quarter of higher valued marketings. Secondly, crop and livestock prices were on the rise going into this drought, providing an early, fairly optimistic outlook for earnings. Underlying much of the crop situation were tight wheat and soybean stocks, rising exports, and increased demand from the livestock sector. The sharp reduction in 1987 CCC loan placements indicated price strength and tightened supplies as the drought approached.

Diverging Income Distribution

Although income and financial gains realized in 1986, and to a greater extent in 1987, should help stabilize the sector's aggregate accounts, the drought's major legacy may be its widely varying distributional impacts. Several factors are influencing regional, farm type, and individual farm level income and cash flow positions. Included among these are on-farm stocks, variation in the types of crops raised, planting dates, the frequency and timing of rains, access to irrigation facilities, and the use of crop insurance. For example, farms with irrigation facilities or large inventories of 1987 crops on hand may actually do better this year than had the drought not occurred.

Producers who were unable to build financial reserves or to restructure debt may be hard hit financially. Drought relief assistance—nearly \$4 billion with the majority earmarked for calendar 1988—will provide some compensation to both program and nonprogram participants. This level of assistance exceeds drought-related reductions in calendar 1988 direct Government payments and is helping stabilize 1988 net cash income.

Table 1--Drought effects on major income components

Item	1979	1980 Drought	1981	1982	1983 Drought	1984
	1977 = 100					
Index of farm prices:	132	134	139	133	135	142
Crops	116	125	134	121	128	138
Livestock	147	144	143	145	141	146
	Billion dollars					
Total receipts:	131.5	139.7	141.6	142.6	136.6	142.3
Crops	62.3	71.7	72.5	72.3	62.1	69.4
Livestock	69.2	68.0	69.2	70.3	69.4	72.9
Value of inventory change	5.0	-6.3	6.5	-1.4	-10.9	6.2
Net cash income	33.4	34.2	32.8	38.1	37.1	38.8
Net farm income	27.4	16.1	26.9	23.5	12.7	32.0

Relative Stability Forecast for 1988 Net Cash Income

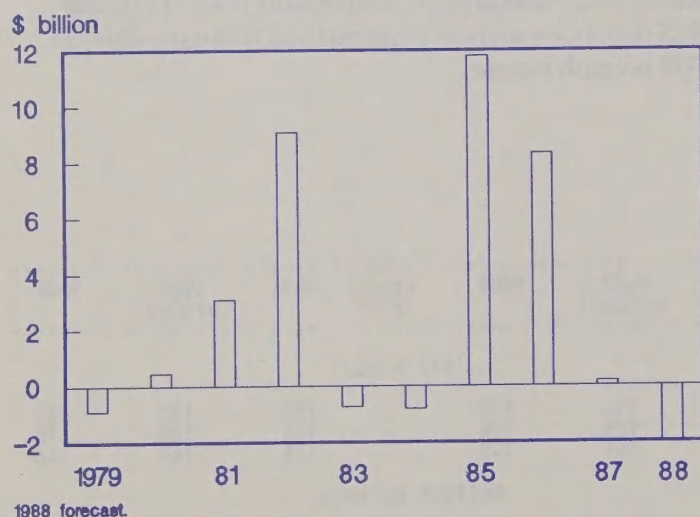
Based on August 1 crop and livestock conditions, net cash income is projected at \$55 to \$60 billion, compared with last year's high of \$57.1 billion. Inventory sales are playing a major role in supporting agriculture's cash position, as are price increases which began in early spring. Also helping stabilize the 1988 income stream and boosting crop receipts are the premiums received for sales of redeemed CCC stocks. The current forecast for 1988 net removals of CCC-held stocks is nearly \$2 billion, over twice the decade's previous high (figure 2). These stocks may then be sold for premiums representing the difference between redemption and market prices.

Net farm income is typically much more volatile than net cash income in times of reduced physical output. In response to production shortfalls estimated at 37, 23, and 13 percent for corn, soybeans, and wheat, the value of inventory liquidations is forecast at \$6 to \$8 billion. As a result, net farm income may decline from last year's \$46 billion high to the \$38- to \$43-billion range in 1988.

Pre-drought Prices and Sales of Previous Years' Stocks Help Stabilize Farm Receipts

Many farmers will experience losses in revenues if their production declines exceed price gains. Some may receive partial compensation through the marketing of unsold stocks of previous years' crops or by redeeming CCC loans and selling these commodities at drought-induced higher prices. Others will have little on which to fall back.

Figure 2
Net CCC Loans



Before the drought, net increases in CCC loan placements were forecast at a very low positive level. This forecast has, however, been reduced to \$2 billion in net redemptions, a dramatic reversal of the net placements in the last 3 years.

Consistent with recent droughts, relative stability is anticipated in livestock receipts. As with crops, livestock earnings were on the rise prior to the drought. First-half prices were high despite projected record combined red meat and poultry production. Forecast record receipts going into the drought provided a cushion against rising feed costs and deteriorating pasture conditions. This year's small cattle herd appears to be preventing the accelerated cullings and consequent fall in prices that are often associated with a drought. Cullings of beef cattle have been only slightly higher than normal since the five largest cattle producing States (Texas, Nebraska, Kansas, Colorado, and Oklahoma) are not in the hardest hit areas. Dairy cattle slaughter has been heavy in the Northern Plains and important dairy States of the Great Lakes. Despite some recent softening of prices, 1988 livestock earnings should rise modestly, edging past last year's record level of \$76.2 billion.

Higher Production Costs and Lower Federal Supports Constrain 1988 Income Growth

Expected growth in crop revenues and a projected modest increase in livestock receipts will likely be kept in check by other factors. Calendar 1988 direct Federal payments, which were projected to decline roughly \$3 billion from last year prior to the drought, may fall an additional \$1.5 to \$2 billion. Much of the total decline will be offset by payments made under the Disaster Assistance Act of 1988.

Figure 3
Gross Cash Income

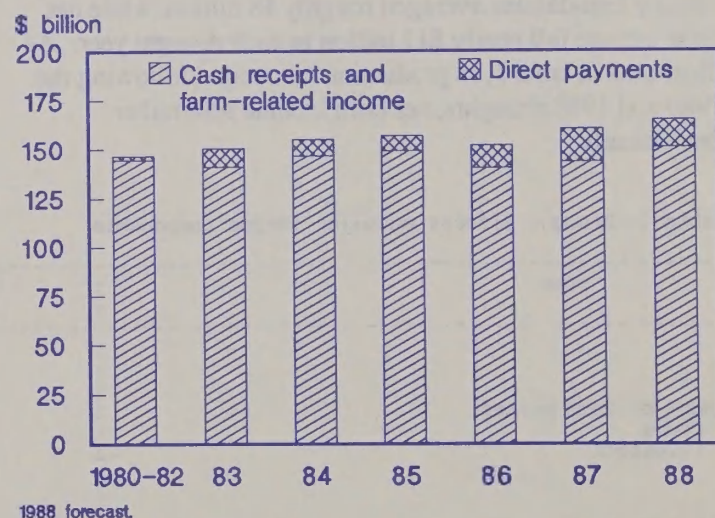


Figure 4

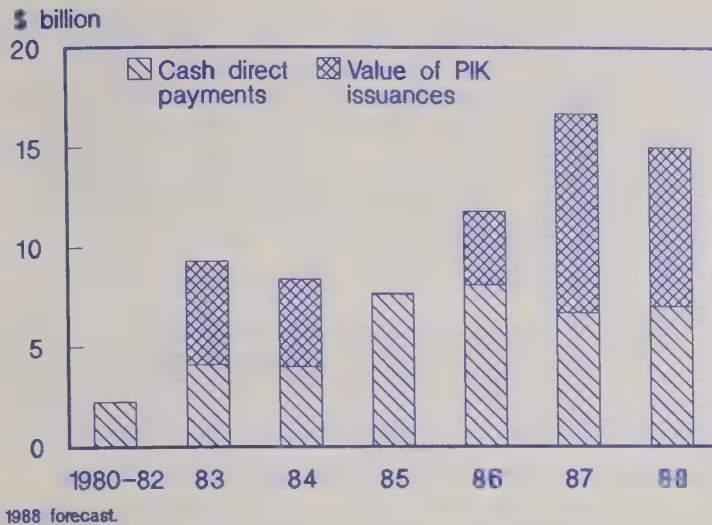
Direct Government Payments: Cash and PIK

Figure 5

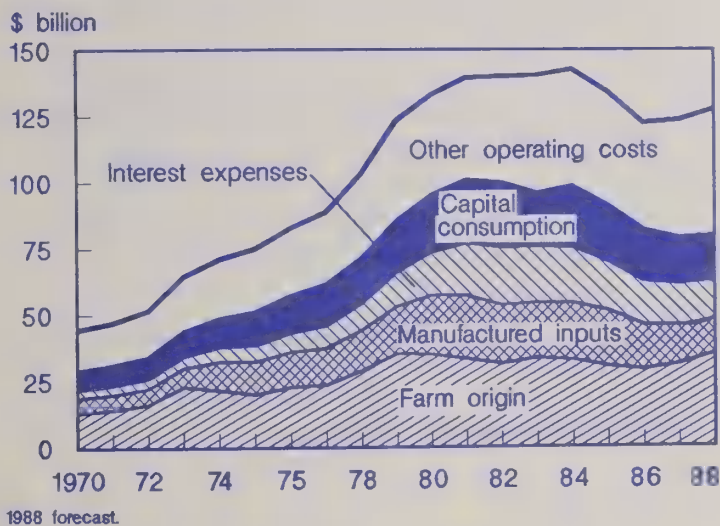
Farm Production Expenses

Figure 6

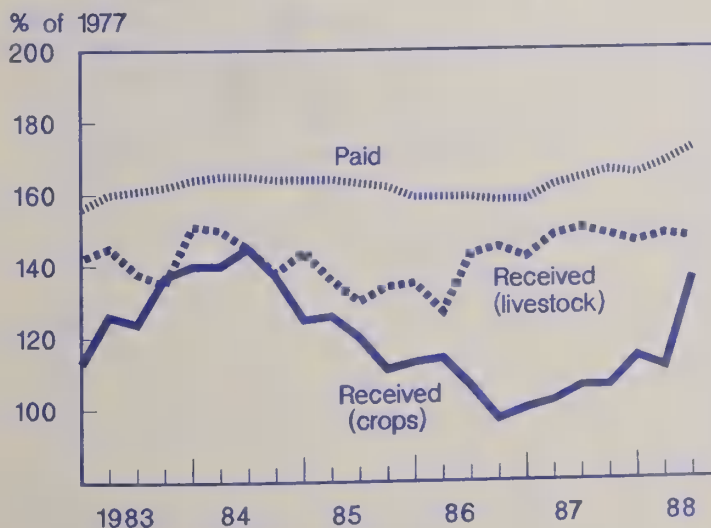
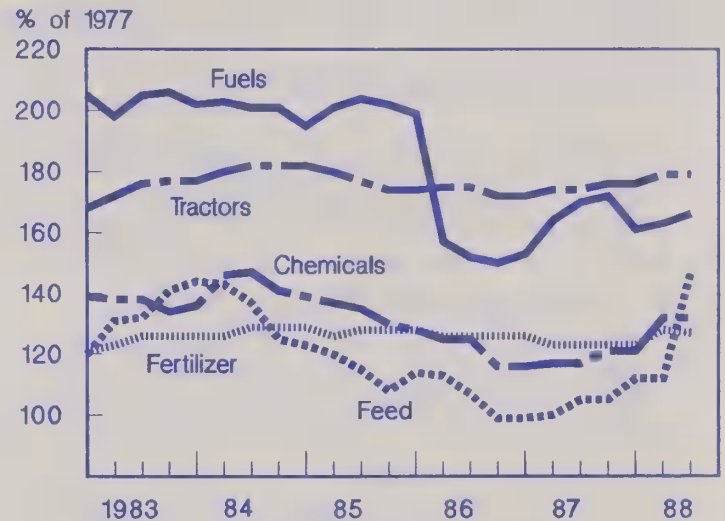
Prices Paid and Received by Farmers

Figure 7

Prices Paid for Major Production Inputs**DROUGHT ASSISTANCE TO PROVIDE RELIEF**

Legislation has been passed to assist farmers and ranchers in drought regions of the country. The primary component of the \$3.9-billion legislation is a three-tiered schedule based on expected pre-drought returns.

- On losses up to 35 percent, advanced deficiency payments would be forgiven on lost production. For losses exceeding 35 percent, producers would receive disaster payments equal to 65 percent of the expected return, but would have to pay back any advanced deficiency payments. For losses exceeding 75 percent of the expected pre-drought return, disaster payments would equal 90 percent of that portion greater than 75 percent.
- The second key component of the bill streamlines existing livestock feeding programs. This assistance will help hard-hit dairy and livestock farmers maintain their foundation herds and alleviate post-drought shortages.
- Additional components include rescinding the scheduled January 50-cent dairy price support cut, increasing it by 50 cents from April through June of 1989; providing modest credit assistance on farm and rural business loans in drought-affected areas; and providing temporary adjustments to guard against future shortages of oats and soybeans. The Secretary of Agriculture would permit farmers to plant soybeans, sunflowers, and oats on a portion of their acreage without losing their historical bases.

Production expenses, led by higher feed and fertilizer costs, may rise \$2 to \$5 billion from a year earlier. Not all of these increased costs are attributable to the drought but they do limit prospective growth in 1988 net cash income.

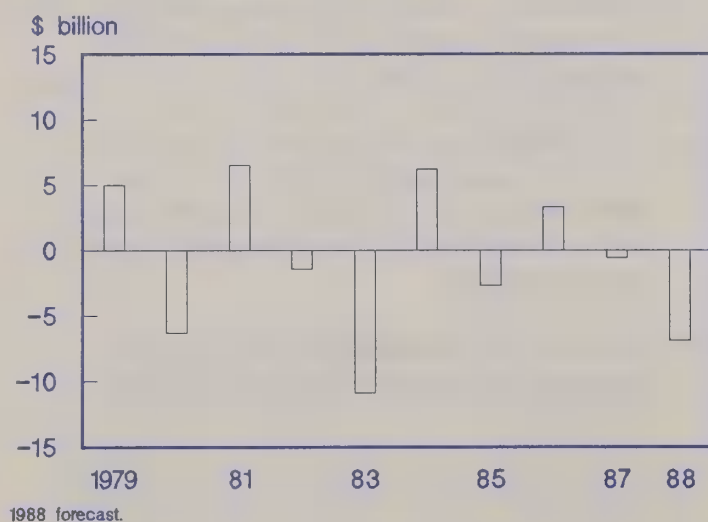
Adjustments Anticipated in 1989

The drought's effects will carry over into 1989. While cash receipts may be higher than in 1988, direct payments could fall and production expenses rise. Disaster Assistance Act payments are less likely to affect calendar 1989 payments as their main impact will be felt in 1988.

If planted acreages for grains and oilseeds expand next year in response to higher prices and lower acreage reduction requirements for program participation, production expenses could increase substantially. Higher feed costs will have a major impact on 1989 costs for livestock producers, as will higher-priced feeder cattle. On the crops side, increased planted acreage will raise variable input costs for seed, fertilizer, chemicals, and fuel.

Rising crop production may boost total cash receipts next year, but higher operating costs and reduced Federal support are likely to be offsetting. Thus, net cash income is likely to fall from 1988's level. In comparison, prospects for 1989 net farm income may be more promising. This production-based measure reflects the value of inventory build-ups, a likely development next year if yields move toward pre-drought levels and acreage reduction requirements are relaxed.

Figure 8
Value of Inventory Adjustments



Reduced Production Causes Swings in Inventory Values

As in past droughts, 1988 will likely experience a large fall in the value of inventories, with net farm income forecast to drop 7 to 18 percent. The likely reduction of set-aside requirements next year and improvement in yields should expand inventories in calendar 1989. The production gains underlying this replenishment of inventories would boost net farm income.

WHY INVENTORIES AFFECT RECEIPTS

The value of the change in inventories plays a major part in calculating net farm income. This accrual-based income concept is a measure of the total value of production in a given calendar year. Net farm income tends to be much more volatile than net cash income largely because of wide swings in production that result in large changes in the value of inventories.

Crop marketing years overlap calendar years so that most of the products sold were produced in the previous calendar year. A sharp drop in production causes large inventory drawdowns as sales of the current and previous year's crop exceed current production. The value of this change in inventories is estimated by multiplying the quantity change by the average market price for the entire year.

Figure 9
Farm Production Regions



WHAT IS THE "PALMER INDEX"?

The Palmer Drought Severity Index identifies relative dryness or wetness and indicates prolonged and abnormal moisture deficiency or excess. It indicates general conditions, not local variations caused by isolated rain. Calculations are made for 350 climatic divisions in the United States and Puerto Rico based on the weekly precipitation total and average temperature, division constants (water capacity of the soil, etc.) and other historic variables in the index.

The Palmer Index is an important climatological tool for evaluating the scope, severity, and frequency of prolonged periods of abnormally dry or wet weather. It can be used to help delineate disaster areas and indicate the availability of irrigation water supplies, reservoir levels, range conditions, amount of stock water, and potential intensity of forest fires.

The equation for the index was empirically derived from the monthly temperature and precipitation scenarios of 13 instances of extreme drought in western Kansas and central Iowa and by assigning an index value of -4 for these cases. Conversely, a +4 represents extremely wet conditions. Within this range are 11 categories of wet and dry conditions:

- -4.0 and below Extreme drought
- -3.0 to -3.99 Severe drought
- -2.0 to -2.99 Moderate drought
- -1.0 to -1.99 Mild drought
- -.50 to -.99 Incipient drought
- -.49 to .49 Near normal
- .50 to .99 Incipient moist spell
- 1.0 to 1.99 Moist spell
- 2.0 to 2.99 Unusual moist spell
- 3.0 to 3.99 Very moist spell
- 4.0 and above Extreme moist spell

Drought Will Affect Some Regions More than Others

The current drought is expected to raise both aggregate receipts and net cash income in 1988. It is most severe in the northern and Great Lakes areas of the Midwest region, the northeastern and southeastern portions of the West, and the Appalachian areas of the Southeast. In contrast, the South-central region has been largely unaffected, as have the coastal portions of the Southeast and significant areas of the Northeast.

The regional farm income picture largely reflects this geographical distribution of the drought. The South-central region is expected to experience an increase of roughly 10 percent over 1987, due largely to a rise in crop receipts of over \$1 billion. The Southeast is also expected to do relatively well as the region's share of U.S. production of corn, wheat, and soybeans is expected to rise in 1988. Net cash income in the other three regions is expected to remain near 1987 levels.

Table 2--Income components by region

Region	Year	: Cash Receipts :		Gov't Payments	: Gross Cash Income	: Cash Expenses:	: Net Cash Income
		:Crops	Livestock:				
Billion dollars							
Northeast	1987	3.3	6.9	0.3	10.8	6.4	4.4
	1988F	3.5	7.1	0.3	11.2	6.7	4 to 5
Southeast	1987	10.9	11.1	1.2	24.0	14.5	9.5
	1988F	11.8	11.4	1.0	25.1	15.0	9 to 11
Midwest	1987	23.3	33.6	10.4	69.7	46.3	23.5
	1988F	25.5	34.4	9.4	71.8	48.2	22 to 24
South- central	1987	6.7	11.6	2.7	21.7	14.5	7.2
	1988F	7.9	11.9	2.4	23.0	15.0	7 to 8
West	1987	17.7	13.1	2.1	34.2	21.7	12.5
	1988F	17.9	13.4	1.9	34.4	22.6	11 to 12
U.S. Total	1987	61.9	76.2	16.7	160.4	103.3	57.1
	1988F	66 to 68	77 to 79	14 to 16	163 to 168	106 to 109	55 to 60

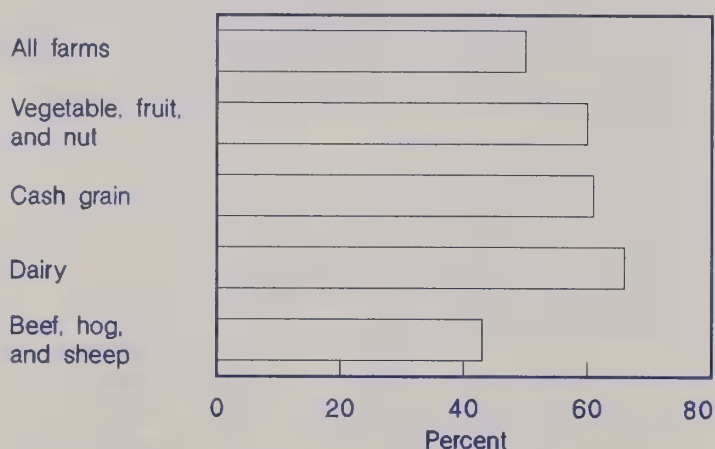
A major factor in the stable income forecast for the Midwest is an estimated \$2-billion rise in the region's soybean receipts. A large part of this increase in soybean receipts is attributable to the overlap in marketing and calendar years. Soybeans produced in 1987 may comprise 60 percent of 1988 marketings, and much of this carryover will have been sold after prices started rising as a consequence of the 1988 drought.

The overlap of marketing and calendar years will help reduce the fall in corn receipts for the region. Crop production in the Midwest is expected to decline roughly 40 percent. The value of the Midwest corn crop is likely to be lower than 1987 as large corn stocks have kept the forecast increase in corn price to under 40 percent. As with soybeans, much of the corn marketed in 1988 is made up of the previous year's production. The high rate of redemption of corn CCC loans also contributes to the stable income picture for the Midwest as a whole.

The Northeast and the West are expected to experience some income growth largely because the drought is not expected to have large impacts on the major commodities of either region. Soybeans and corn contribute relatively little to total receipts in these regions. Winter wheat is important in the West and it essentially escaped the drought. Dairy is important in both regions and only a modest income decline is expected for this commodity. Vegetables, fruits, and greenhouse and nursery products play a relatively large role in these two regions and moderate growth in receipts is expected.

Figure 10

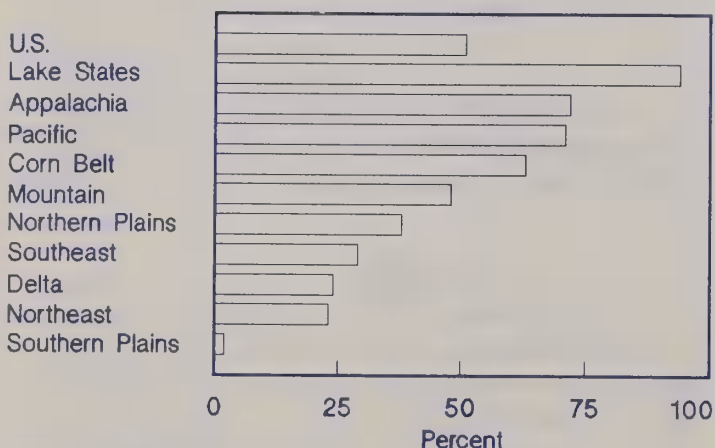
Percent of Farms in Drought Counties



Based on Palmer Index as of July 9.

Figure 11

Percent of Farms in Drought Counties by Region



Based on Palmer Index as of July 9.

Even though total income in most of these regions may rise, some farmers will gain and others lose. In the Midwest, for example, many areas of Nebraska were unaffected by the drought. As a consequence, Nebraska's share of total corn production is expected to rise by nearly half, from 11.5 percent in 1987 to 16.8 percent. In contrast, Illinois' share may fall 12 percent.

The uneven impact of the drought within regions is also illustrated by data from the Farm Costs and Returns Survey (FCRS) taken this past Spring. According to the FCRS, 51 percent of all farms at the beginning of 1988 were in counties currently experiencing severe to extreme drought. In general, these farms are the ones most likely to experience substantial losses due to the drought. These farms are also unevenly distributed both among and within regions. For example, in extensive portions of the Midwest, Michigan, Minnesota, and Wisconsin, and North and South Dakota, over 90 percent of all farms are in severely affected counties.

Table 3--Percent of farms classified marginally solvent and vulnerable: January 1, 1988

Region	Drought Counties	Total
Northeast	8	10
Lake States	22	22
Corn Belt	20	18
Northern Plains	24	21
Appalachia	10	8
Southeast	9	10
Delta	11	12
Southern Plains	19	12
Mountain	16	16
Pacific	18	16
U.S.	18	15

Source: 1987 FCRS. Drought counties based on Palmer Index as of July 9.
F = Forecast.

Table 4--Selected operating characteristics of commercial cash grain farms in the Midwest and Lake States, 1987

	Counties with Severe or Extreme Drought 1/	Counties with Less than Severe Drought
Dollars per farm		
Crop Sales	86,514	24,478
Livestock Sales	56,655	76,857
Operating Expenses	85,498	95,579
Irrigation Expenses 2/	5,042	1,124
Federal Crop Ins. 2/	1,527	3,283
Crop Inventory 3/	46,868	55,026

Source: 1987 FCRS. 1/ Measured by the Palmer index as of July 9. 2/ Average of farmers reporting expense. 3/ As of end of 1987.

Table 5--Financial characteristics of farms in drought counties

Major drought regions				
Northern Plains: Corn Belt and: Far : Appalachia Wheat Belt 1/ :Lake States 2/: West 3/:and Southeast 4/				
	Percent			
Region's commercial farms in drought counties	82	79	72	44
Region's financially vulnerable farms in drought counties 5/	94	86	65	54
Region's commercial farm sales in drought counties				
1. Wheat	94	65	46	22
2. Corn and soybeans	59	73	72	33
3. Dairy	82	88	82	30
4. Cattle	70	78	75	52
5. Hogs	58	79	8	35
Region's commercial farms' financial obligations in drought counties				
1. Debt	86	82	77	43
2. Interest and cash rent	84	82	75	33
Commercial farms in drought counties with irrigation or insurance				
1. Irrigation facilities	11	2	80	2
2. Federal Crop Insurance	19	11	8	2

1/ MT, ND, SD, WY. 2/ IA, IN, IL, MI, MO, MN, OH, WI. 3/ CA, ID, NV, OR, UT, WA.
4/ AL, FL, GA, KY, NC, SC, TN, VA, WV. 5/ Financially vulnerable farms have debt larger than 40 percent of assets and negative cashflows in 1987.

Source: The 1987 Farm Costs and Returns Survey (FCRS) and the longterm Palmer Drought Index of July 9, 1988. Comparison of data in the 1982 Census of Agriculture and the 1987 FCRS indicate production patterns tend to be quite stable between years. NOTE: Drought counties are those designated as experiencing severe or extreme drought according to the Palmer drought index. Commercial farms are those with annual sales of \$40,000 or more.

The degree to which a farmer is affected by the drought will depend on factors such as access to irrigation, stocks of unsold commodities, and the level of crop insurance. Table 4 shows the averages for commercial cash grain farms in severely affected counties and in less affected ones in the Corn Belt and Lake States. Although fewer than 1 percent of the farms in both groups of counties reported any irrigation expenditures in 1987, they probably did relatively well during the drought.

Nearly a quarter of the farms in severely affected counties reported Federal crop insurance compared to only 14 percent

in less affected counties. Furthermore, the average premium for farmers in the former was roughly half the average premium for farmers in the latter.

The FCRS data also indicate that even though most farmers were in a relatively strong financial condition at the beginning of the year, a higher proportion of those in severely affected counties were rated marginally solvent or vulnerable to default. The drought hit a large number of farmers who had not fully recovered from the financial difficulties of the early to mid-1980's, and are least able to handle the situation.

MIDWEST COMMERCIAL FARMS HARDEST HIT

Commercial farms with sales over \$40,000 are the most likely to experience major financial losses due to drought. They account for about 85 percent of farm sector receipts, typically view farming as their primary occupation, and suffer higher rates of financial stress than smaller farms. Their probability of being financially vulnerable with debt/asset ratios over .40 and negative cashflows is more than twice as great as smaller farms. About four of every five dollars of debt held by financially vulnerable farms are liabilities of commercial farms. Thus, the impacts of severe drought conditions tend to be especially large among these farms.

Four aggregated regions contain about 93 percent of the commercial farms located in severe or extreme drought counties, table 5. These regions cover 27 States and coincide with drought weather patterns rather than the standard production regions most often used by USDA. The financial hardship of drought will be most severe in the four States of the Northern Plains Wheat Belt and the eight States forming the Corn Belt and Lake States. For these regions:

- Four of five commercial farms are in drought counties, and an even larger proportion of the vulnerable farms.
- In 1987, irrigation facilities were used by only 11 percent of the commercial operators in drought counties in the Northern Plains Wheat Belt and only 2 percent in the Corn Belt and Lake States, compared to 80 percent in the Far West.
- While only one of every five commercial farmers in the Northern Plains had Federal Crop Insurance last year, the average reported annual premium of \$1,600 suggests relatively comprehensive coverage in comparison to \$33,200 reported crop sales.

Note that because rainfall patterns vary widely within counties, not all farms located in drought counties will experience substantial yield reductions. Thus, the focus on all farms in drought counties suggests an upper limit of potential damage.

The widespread nature of the drought is evident from the large share of commercial farm production in those counties. Approximately 60 to 90 percent of wheat, corn, soybean, dairy, cattle, and hog production in the Northern Plains Wheat Belt and Corn Belt and Lake States is in drought counties.

The Far West winter wheat crop escaped drought damage this year, and corn and soybeans are minor commodities in this region. Furthermore, most crops are irrigated. Thus, in the Far West dairy and cattle producers appear likely to be most adversely affected by drought conditions that raise feed costs. Commercial cattle producers in Appalachia and the Southeast are likely to face a similar situation. Dairy producers growing the majority of their forage and feed in these regions will likely do better than their counterparts in other drought areas.

PRELIMINARY 1987 STATE FARM INCOME ESTIMATES

Newly updated preliminary estimates show 1987 U.S. net farm income at \$46.3 billion, up \$8.8 billion (23.3 percent) from 1986. Gross farm income rose by \$9.9 billion (6.2 percent) while total production expenses increased by \$1.2 billion (1.0 percent). Net cash income increased by \$5.7 billion or 11 percent while net business income increased 19.8 percent to \$42.6 billion. Off-farm income increased 4.8 percent to \$46.8 billion.

States reflected the same general trends as the national average in the major income categories. Net farm income increased in 44 States and decreased in six. Increases averaged 24.0 percent while the decrease was 9.9 percent. Total production expenses fell in 27 States by an average of 1.8 percent and increased in 23 an average of 3.2 percent. Gross farm income increased in 41 States and decreased in nine. Increases averaged 7.0 percent while decreases averaged 1.9 percent.

The largest percentage increases in net farm income were in Wyoming, South Carolina, Maine, Louisiana, Mississippi, and Nevada. The Wyoming and Nevada gains were due largely to increased value of livestock product marketings. Higher cattle prices and livestock inventory reductions contributed. Improved net farm income in South Carolina, Maine, Louisiana, and Mississippi resulted from increased production and higher prices for tobacco, potatoes, cotton, and cottonseed. Generally, production increased from a relatively poor 1986. The largest percentage decreases in net farm income were in West Virginia, Delaware, Massachusetts, New Hampshire, Rhode Island, and Hawaii. The West Virginia, Delaware, Massachusetts, and New Hampshire declines resulted from lower cash receipts of apples, broilers, eggs, and milk, respectively. Poultry prices were notably lower in the Northeast. For each State with declines in net farm income, total production expenses increased relative to gross farm income.

Nominal net farm income reached record levels in 29 States for 1987. However, no State had a real net farm income record. For the 29 States, net farm income increased 23.9 percent, gross farm income increased 7.1 percent, and production expenses increased only 1.6 percent. Gross farm income increases reflected the improved value of livestock marketings, while crop marketings declined slightly.

For the remaining 21 States, production expenses fell by 0.7 percent from 1986 and gross farm income rose 3.9 percent, raising net farm income 21.8 percent. Gross farm income increased less for this group because large livestock marketings were offset by smaller crop marketings. Notably, five of the six States with the largest percentage increases in net farm income from 1986 to 1987 were among the

group of nonrecord income States. Those States with the largest percentage changes in net farm income appeared to have rebounded strongly from relatively poor earnings in 1986.

State Rankings Relatively Unchanged

Changes in gross farm income and production expenses had little impact on State rankings for net farm income. Nine of the top 10 States for net farm income in 1987 were there in 1986. North Carolina replaced Washington in 1987. California was first followed by Texas, Iowa, Florida, and Nebraska. The top 10 accounted for 54.0 percent of total U.S. net farm income in 1987, compared to 54.5 percent in 1986.

Especially high net farm income per operation or acre reflects high valued or relatively perishable crops usually produced near large metropolitan areas. Conversely, low net income per operation or acre typically occurs where farms are isolated or produce farm products which require a great deal of land.

Rhode Island ranked first in net farm income per acre. The approximately 750 farms averaged 97 acres and \$636 per acre. In contrast, Wyoming had about 8,800 farms averaging 1,700 acres with net farm income of less than \$2 per acre.

The leading commodities for Rhode Island were greenhouse, dairy products, eggs, and potatoes. Such high-value, labor and capital intensive products tend to be typical of more populated States with small farms. Rhode Island's four leading commodities accounted for 65 percent of total farm marketings for the State. The value of farm marketings from California's four leading commodities, (dairy products, cattle, greenhouse, and grapes), by comparison, accounted for 41 percent of farm marketings. The mix of land, labor, and capital resources required for California's leading commodities is indicative of larger farms compared to those in Rhode Island.

Rankings of States by farm marketings tend to remain stable year to year. California, Iowa, Texas, Nebraska, and Illinois led in 1986, while Texas and Iowa switched positions in 1987. Rankings by livestock and product marketings changed slightly. Texas, Iowa, California, Nebraska, and Wisconsin led in 1986, with California and Nebraska exchanging positions in 1987. California ranked first in the value of crop marketings in 1987 followed by Florida, Illinois, Iowa, and Texas.

A notable change occurred in the percentage of total farm marketings accounted for by crops. In 1987, crops represented 44.8 percent of total farm marketings, down from 47.0 percent in 1986. Cattle, dairy products, hogs, and

Table 6---State rankings for net farm income: total, per farming operation, and per acre, 1987

Rank	Total		Per Operation		Per Acre		Rank
	State	Value (\$ mil.)	State	Value (Dollars)	State	Value (Dollars)	
1	CALIFORNIA	5,681.8	CALIFORNIA	73,790	RHODE ISLAND	636	1
2	TEXAS	3,725.9	ARIZONA	71,492	CONNECTICUT	352	2
3	IOWA	2,776.8	RHODE ISLAND	61,924	NEW JERSEY	339	3
4	FLORIDA	2,305.9	FLORIDA	59,125	MASSACHUSETTS	268	4
5	NEBRASKA	2,064.2	DELAWARE	46,887	DELAWARE	231	5
6	MINNESOTA	1,998.5	HAWAII	42,306	FLORIDA	177	6
7	WISCONSIN	1,741.0	CONNECTICUT	41,897	CALIFORNIA	174	7
8	KANSAS	1,686.8	NEW JERSEY	37,920	MARYLAND	158	8
9	ILLINOIS	1,577.1	NEBRASKA	36,860	NORTH CAROLINA	131	9
10	NORTH CAROLINA	1,417.6	WASHINGTON	35,512	PENNSYLVANIA	124	10
11	WASHINGTON	1,313.9	MASSACHUSETTS	30,345	WISCONSIN	99	11
12	GEORGIA	1,215.1	COLORADO	28,702	GEORGIA	93	12
13	ARKANSAS	1,197.2	SOUTH DAKOTA	27,500	HAWAII	91	13
14	PENNSYLVANIA	1,050.4	IDAHO	27,147	MAINE	90	14
15	MISSOURI	994.8	IOWA	25,952	WASHINGTON	83	15
16	SOUTH DAKOTA	962.5	GEORGIA	25,316	IOWA	83	16
17	OHIO	956.2	ARKANSAS	24,432	ARKANSAS	78	17
18	INDIANA	930.1	KANSAS	24,097	VERMONT	77	18
19	OKLAHOMA	924.6	TEXAS	23,287	ALABAMA	73	19
20	KENTUCKY	869.8	NORTH DAKOTA	23,212	NEW YORK	71	20
21	ALABAMA	808.2	ALASKA	22,509	MINNESOTA	67	21
22	OREGON	788.6	MARYLAND	22,250	MICHIGAN	65	22
23	COLORADO	769.2	WISCONSIN	21,763	NEW HAMPSHIRE	63	23
24	NORTH DAKOTA	754.4	MINNESOTA	21,723	OHIO	61	24
25	MISSISSIPPI	735.6	NEW MEXICO	21,597	KENTUCKY	60	25
26	MICHIGAN	731.3	OREGON	21,312	INDIANA	57	26
27	TENNESSEE	641.8	NEVADA	20,321	ILLINOIS	55	27
28	IDAHO	624.4	NORTH CAROLINA	19,689	SOUTH CAROLINA	54	28
29	NEW YORK	612.4	ILLINOIS	18,775	MISSISSIPPI	53	29
30	ARIZONA	600.5	PENNSYLVANIA	18,592	VIRGINIA	52	30
31	VIRGINIA	499.2	MAINE	17,521	TENNESSEE	51	31
32	LOUISIANA	387.6	VERMONT	17,169	IDAHO	45	32
33	MARYLAND	378.3	ALABAMA	16,494	OREGON	44	33
34	MONTANA	349.3	MISSISSIPPI	16,347	NEBRASKA	44	34
35	NEW MEXICO	291.6	NEW YORK	15,121	LOUISIANA	40	35
36	NEW JERSEY	288.2	MONTANA	14,992	KANSAS	35	36
37	SOUTH CAROLINA	282.2	OKLAHOMA	13,208	MISSOURI	33	37
38	MASSACHUSETTS	182.1	UTAH	12,958	OKLAHOMA	28	38
39	HAWAII	177.7	INDIANA	12,918	TEXAS	28	39
40	UTAH	176.2	MICHIGAN	12,609	COLORADO	23	40
41	CONNECTICUT	155.0	OHIO	11,384	SOUTH DAKOTA	22	41
42	DELAWARE	145.4	SOUTH CAROLINA	10,854	NORTH DAKOTA	19	42
43	MAINE	136.7	LOUISIANA	10,766	ARIZONA	16	43
44	VERMONT	123.6	NEW HAMPSHIRE	10,310	UTAH	16	44
45	WYOMING	61.8	VIRGINIA	9,985	ALASKA	11	45
46	NEVADA	48.8	KENTUCKY	8,786	WEST VIRGINIA	8	46
47	RHODE ISLAND	46.4	MISSOURI	8,726	NEW MEXICO	7	47
48	NEW HAMPSHIRE	33.0	WYOMING	7,101	MONTANA	6	48
49	WEST VIRGINIA	29.2	TENNESSEE	6,686	NEVADA	6	49
50	ALASKA	14.9	WEST VIRGINIA	1,388	WYOMING	2	50
	UNITED STATES	42,263.8	UNITED STATES	21,286	UNITED STATES	46	

Table 7--Net farm income for States, 1986-87

State	1986			1987		
	Gross farm income	Total production expenses	Net farm income	Gross farm income	Total production expenses	Net farm income
Million dollars						
ALABAMA	2,432.5	1,736.6	695.9	2,558.3	1,750.1	808.2
ALASKA	35.6	21.3	14.3	37.8	22.9	14.9
ARIZONA	1,749.8	1,349.6	400.2	2,065.2	1,464.6	600.5
ARKANSAS	3,639.0	2,567.4	1,071.6	3,884.4	2,687.2	1,197.2
CALIFORNIA	15,477.7	10,859.9	4,617.8	16,786.4	11,104.6	5,681.8
COLORADO	3,580.6	3,036.0	544.5	4,014.0	3,244.8	769.2
CONNECTICUT	449.1	297.3	151.8	443.5	288.5	155.0
DELAWARE	554.5	389.7	164.8	524.7	379.4	145.4
FLORIDA	5,021.6	3,051.1	1,970.4	5,471.6	3,165.7	2,305.9
GEORGIA	3,620.6	2,558.5	1,062.1	3,748.1	2,533.0	1,215.1
HAWAII	604.0	419.1	184.9	597.8	420.1	177.7
IDAHO	2,371.1	1,907.7	463.4	2,563.9	1,939.5	624.4
ILLINOIS	7,874.6	6,381.5	1,493.1	7,724.6	6,147.5	1,577.1
INDIANA	4,662.2	3,917.7	744.5	4,840.1	3,910.0	930.1
IOWA	10,522.0	8,201.2	2,320.8	11,060.2	8,283.3	2,776.8
KANSAS	6,927.0	5,467.5	1,459.4	7,286.2	5,599.4	1,686.8
KENTUCKY	2,786.9	2,138.2	648.7	2,949.6	2,079.8	869.8
LOUISIANA	1,678.0	1,493.6	184.4	1,828.1	1,440.5	387.6
MAINE	457.4	395.9	61.6	531.6	395.0	136.7
MARYLAND	1,351.0	981.3	369.7	1,344.9	966.6	378.3
MASSACHUSETTS	523.6	319.5	204.1	504.7	322.6	182.1
MICHIGAN	3,208.1	2,614.6	593.5	3,283.9	2,552.6	731.3
MINNESOTA	7,130.8	5,435.5	1,695.4	7,409.3	5,410.8	1,998.5
MISSISSIPPI	2,186.4	1,809.6	376.9	2,582.0	1,846.4	735.6
MISSOURI	4,254.6	3,497.3	757.3	4,476.4	3,481.6	994.8
MONTANA	1,766.8	1,509.2	257.6	1,851.1	1,501.8	349.3
NEBRASKA	8,089.5	6,322.6	1,767.0	8,673.9	6,609.7	2,064.2
NEVADA	244.2	218.6	25.7	255.9	207.1	48.8
NEW HAMPSHIRE	152.5	117.4	35.1	148.0	115.0	33.0
NEW JERSEY	750.4	490.7	259.7	768.2	480.0	288.2
NEW MEXICO	1,169.3	951.6	217.7	1,323.5	1,031.9	291.6
NEW YORK	2,909.9	2,347.5	562.4	2,873.5	2,261.1	612.4
NORTH CAROLINA	4,321.6	3,156.2	1,165.5	4,562.7	3,145.1	1,417.6
NORTH DAKOTA	3,143.9	2,454.1	689.8	3,143.1	2,388.7	754.4
OHIO	4,139.3	3,325.6	813.8	4,192.0	3,235.8	956.2
OKLAHOMA	3,412.2	2,541.5	870.7	3,493.4	2,568.8	924.6
OREGON	2,237.6	1,572.7	664.9	2,372.8	1,584.2	788.6
PENNSYLVANIA	3,637.7	2,740.8	896.9	3,758.3	2,707.9	1,050.4
RHODE ISLAND	87.6	38.6	49.1	87.7	41.3	46.4
SOUTH CAROLINA	1,047.0	927.5	119.5	1,204.4	922.2	282.2
SOUTH DAKOTA	3,030.5	2,303.2	727.3	3,382.8	2,420.3	962.5
TENNESSEE	2,358.1	1,959.3	398.8	2,653.0	2,011.2	641.8
TEXAS	10,710.0	8,335.7	2,374.3	12,533.7	8,807.8	3,725.9
UTAH	727.4	598.7	128.7	751.1	574.9	176.2
VERMONT	468.4	369.0	99.4	478.6	355.0	123.6
VIRGINIA	2,035.8	1,631.5	404.3	2,139.2	1,640.0	499.2
WASHINGTON	3,615.4	2,405.3	1,210.1	3,711.3	2,397.4	1,313.9
WEST VIRGINIA	343.7	300.2	43.5	318.3	289.1	29.2
WISCONSIN	5,655.6	4,197.0	1,458.6	5,826.2	4,085.1	1,741.0
WYOMING	679.3	674.3	4.9	745.5	683.7	61.8
UNITED STATES	159,832.5	122,336.2	37,496.3	169,765.5	123,501.9	46,263.6

Table 8--Farm marketings, 1986 and 1987, government payments, 1987 and principal commodities, 1987, by State

State	1986				1987				State rank for total farm marketings, four principal commodities in order of marketing receipts, and percentage of total marketings
	Farm marketings		Farm marketings		Farm marketings		Government payments		
	Total	Crops	Livestock and products	Total	Crops	Livestock and products			
Million dollars									
AL	2,020.3	595.0	1,425.3	2,148.1	588.4	1,559.7	125.2	25-Broilers, cattle, eggs, greenhouse (71%)	
AK	28.0	17.8	10.2	29.4	18.7	10.7	2.4	50-Greenhouse, dairy prod, hay, potatoes (80%)	
AZ	1,614.4	918.2	696.1	1,780.8	1,006.7	774.1	97.3	30-Cattle, cotton, dairy prod, lettuce (65%)	
AR	3,004.8	987.6	2,017.3	3,143.4	1,026.9	2,116.5	397.6	16-Broilers, soybeans, cattle, cotton (67%)	
CA	14,644.5	10,209.2	4,435.3	15,521.8	10,780.9	4,741.0	462.0	1-Dairy prod, cattle, greenhouse, grapes (41%)	
CO	3,105.8	1,887.7	1,218.1	3,191.4	870.3	2,321.1	342.0	15-Cattle, wheat, dairy prod, corn (79%)	
CT	374.3	165.6	208.7	365.8	170.1	195.8	4.5	45-Greenhouse, eggs, dairy prod, tobacco (77%)	
DE	520.5	118.9	401.6	484.6	114.2	370.3	12.2	41-Broilers, greenhouse, soybean, dairy prod (81%)	
FL	4,713.9	3,696.3	1,017.6	5,227.0	4,125.3	1,101.7	42.5	8-Greenhouse, oranges, tomatoes, cattle (51%)	
GA	3,195.3	1,311.6	1,883.6	3,086.9	1,260.8	1,826.1	245.2	17-Broilers, peanuts, cattle, eggs (60%)	
HI	564.9	481.3	83.6	558.5	470.5	88.0	0.4	40-Sugar, pineapples, greenhouse, nuts (73%)	
ID	1,936.1	1,052.4	883.7	2,046.5	1,120.0	926.5	234.4	26-Cattle, potatoes, dairy prod, wheat (66%)	
IL	6,766.4	4,611.7	2,154.7	6,174.5	3,912.6	2,261.8	1,477.6	5-Corn, soybeans, hogs, cattle (88%)	
IN	4,061.0	2,201.2	1,859.8	3,872.4	2,016.1	1,856.3	670.2	10-Corn, soybeans, hogs, cattle (74%)	
IA	8,984.2	4,003.1	4,981.1	8,780.3	3,509.9	5,270.4	1,987.7	3-Hogs, cattle, soybeans, corn (92%)	
KS	5,332.8	1,866.5	3,466.3	5,721.5	1,807.2	3,914.3	966.3	7-Cattle, wheat, sorghum grain, soybeans (85%)	
KY	2,402.3	1,040.3	1,362.0	2,418.6	912.9	1,505.7	178.3	23-Horses, cattle, tobacco, dairy prod (72%)	
LA	1,352.1	837.0	515.2	1,419.7	899.2	520.5	209.3	32-Cotton, soybeans, cattle, sugar (58%)	
ME	386.4	139.5	246.9	413.3	169.9	243.3	8.1	42-Potatoes, dairy prod, eggs, cattle (74%)	
MD	1,184.6	373.6	811.1	1,127.8	393.6	734.2	49.0	35-Broilers, dairy prod, greenhouse, cattle (70%)	
MI	415.9	286.4	129.5	392.7	268.4	124.3	4.8	44-Greenhouse, dairy prod, cranberries, eggs (74%)	
MI	2,567.4	1,326.9	1,240.5	2,503.9	1,218.7	1,285.2	391.1	22-Dairy prod, cattle, hogs, corn (54%)	
MN	6,029.9	2,622.3	3,407.7	5,809.3	2,164.6	3,644.7	1,193.8	6-Dairy prod, cattle, hogs, soybeans (69%)	
MS	1,796.4	748.6	1,047.8	1,979.0	938.9	1,040.2	302.5	27-Cotton, broilers, soybeans, cattle (71%)	
MO	3,505.5	1,537.0	1,968.4	3,690.6	1,517.3	2,173.3	489.8	12-Cattle, soybeans, hogs, dairy prod (73%)	
MO	1,121.4	649.3	472.1	1,347.4	587.1	760.3	352.3	33-Cattle, wheat, barley, dairy prod (85%)	
NE	6,813.0	2,561.8	4,251.2	6,823.1	1,975.1	4,848.0	1,274.4	4-Cattle, corn, hogs, soybeans (88%)	
NV	238.0	79.2	158.8	243.2	75.8	167.4	3.9	46-Cattle, hay, dairy prod, potatoes (89%)	
NH	109.8	37.6	72.2	103.9	37.9	66.0	2.8	48-Dairy prod, greenhouse, cattle, apples (77%)	
NJ	581.7	431.9	149.8	563.0	423.3	139.7	11.4	39-Greenhouse, dairy prod, eggs, tomatoes (52%)	
NM	1,015.6	303.4	711.8	1,147.3	330.5	816.7	93.3	34-Cattle, dairy prod, hay, greenhouse (76%)	
NY	2,590.0	782.0	1,807.9	2,526.5	726.3	1,800.2	109.3	21-Dairy prod, greenhouse, cattle, apples (75%)	
NC	3,757.0	1,586.0	2,171.0	3,715.2	1,634.1	2,081.1	190.2	11-Tobacco, broilers, hogs, turkeys (56%)	
ND	2,310.3	1,639.0	671.3	2,308.1	1,548.4	759.7	719.8	24-Wheat, cattle, barley, sunflower (69%)	
OH	3,589.0	2,003.5	1,585.5	3,421.8	1,807.7	1,614.1	431.9	13-Soybeans, dairy prod, corn, hogs (66%)	
OK	2,582.1	707.9	1,874.2	2,752.2	699.8	2,052.4	362.8	19-Cattle, wheat, dairy prod, broilers (78%)	
OR	1,778.0	1,124.0	654.1	1,860.7	1,205.5	655.2	127.4	29-Cattle, greenhouse, dairy prod, wheat (46%)	
PA	3,144.6	902.9	2,241.7	3,224.2	905.0	2,319.2	71.8	14-Dairy prod, cattle, greenhouse, eggs (68%)	
RI	75.5	63.5	12.0	75.3	63.4	11.9	0.1	49-Greenhouse, dairy prod, eggs, potatoes (65%)	
SC	897.9	442.0	455.9	931.2	470.2	461.0	114.1	36-Tobacco, cattle, dairy prod, soybeans (46%)	
SD	2,375.4	888.9	1,486.5	2,722.6	813.0	1,909.7	504.8	20-Cattle, hogs, wheat, soybeans (75%)	
TN	1,354.3	813.3	541.0	1,932.7	825.9	1,106.8	156.7	28-Cattle, dairy prod, cotton, greenhouse (61%)	
TX	8,703.7	3,186.2	5,517.5	9,086.5	3,027.4	6,059.1	1,441.2	2-Cattle, cotton, dairy prod, greenhouse (73%)	
UT	575.8	133.8	442.0	596.1	133.6	462.5	44.5	38-Cattle, dairy prod, hay, turkeys (72%)	
VT	396.6	35.7	360.9	412.4	35.5	376.9	7.1	43-Dairy prod, cattle, hay, apples (94%)	
VA	1,629.3	478.7	1,150.6	1,692.2	448.2	1,244.0	87.3	31-Cattle, dairy prod, broilers, tobacco (61%)	
WA	2,807.3	1,827.7	979.6	2,841.4	1,859.6	981.9	292.2	18-Dairy prod, apples, cattle, wheat (57%)	
WV	215.1	59.2	155.9	220.9	52.0	169.0	10.6	47-Cattle, dairy prod, broilers, apples (72%)	
WI	4,866.5	844.5	4,022.0	5,017.0	795.1	4,221.9	406.0	9-Dairy prod, cattle, hogs, corn (85%)	
WY	566.4	115.7	450.7	642.0	113.6	528.4	36.0	37-Cattle, sugar beets, sheep, hay (87%)	
US	135,102.3	63,553.9	71,548.4	138,094.4	61,876.1	76,218.3	16,746.7	Cattle, dairy prod, hogs, soybeans (52%)	

soybeans were principal U.S. commodities in 1987, totaling 52 percent of total farm marketings.

FARM SECTOR BALANCE SHEET

Responding to higher net cash income, farm real estate values rose 2.5 percent in 1987. While this year's drought is expected to reduce land values in severely affected local markets, nationwide real estate assets are forecast to increase 2 to 4 percent. Farm debt dropped more than 8 percent in 1987, \$50 billion below its 1983 peak. During 1988, debt is expected to continue to decline, but at a much slower rate. The rate of debt reduction will depend on farmers' responses to high net cash income and the timing of drought relief payments. Higher asset values and lower farm debt boosted farm equity \$30 billion in 1987. Farm equity is likely to rebound further to a level of \$580 to \$590 billion by the end of 1988. Preliminary State estimates for December 31, 1987, farm business asset, debt, and equity levels are presented in tables 9-12.

Farm Asset Growth

The value of U.S. agricultural assets (excluding operator households) on December 31, 1988, is forecast at \$720 to \$730 billion, up 1.5 to 3 percent from 1987 mostly due to rising farm real estate values.

Nonreal estate assets are expected to remain near 1987 levels. A decline in the value of crop inventories is expected to be mostly offset by an increase in livestock inventory values. The value of crops stored on farms rose slightly in 1987 but may fall about 20 percent in 1988 due to the drought-induced drawdown in stocks. Livestock and poultry inventory values are expected to rise another 2 to 9 percent in 1988, due mainly to higher cattle values. The farm value of machinery and equipment fell by nearly \$8 billion (an 8-percent decrease) in 1987, but is expected to stabilize in 1988. The increased sales and higher prices of new machinery are anticipated to just offset the depreciation of the larger stock of machinery purchased in the early 1980's. Farm financial assets stabilized at about \$34 billion in 1987 and are expected to remain at this level through 1988.

Farm Debt Decline Moderates

The rate of reduction in farm debt levels should slow from 1987's 8 percent to 4 percent in 1988. The drought will likely dramatically affect individual farmers' debt levels. Those farms escaping much of the drought will benefit from higher prices and near normal production levels. The resulting higher than anticipated income can be used to reduce debt levels, increase cash capital expenditures, and avoid borrowing for next year's crop production. For those farmers in severe drought areas, the changes in

debt levels will depend on the amount and timing of Federal drought relief.

Real estate debt decreased by 8 percent in 1987, and may decline by 1 to 4 percent in 1988. However, substantial borrowing for expansion by farmers with cash, and lender aggressiveness in promoting sales of acreages acquired through foreclosure, could increase farm real estate debt by the end of 1988. Nonreal estate debt declined over 7 percent to \$62 billion in 1987, but should remain in the \$60 to \$64 billion range this year. Farmers are likely to maintain their nonreal estate debt levels, rather than borrowing against real estate to offset the negative financial effects of the drought.

Equity Rising

Farm equity is expected to be up 2 to 4 percent in 1988 to over \$580 billion, marking the second year of increase following a 35-percent decline from 1980's peak until 1986. Real farm equity (measured in 1982 dollars) rose 2.5 percent in 1987 and is forecast to rise another 1 to 2 percent in 1988.

Farm equity growth is being driven by both increasing asset values and decreasing amounts of debt used to finance operating expenses and purchases of land, machinery, and equipment. This strengthening of farm sector health is essential for long-term financial recovery.

FINANCIAL RATIOS AND RETURNS

U.S. farm sector liquidity, solvency, profitability, and financial efficiency ratios (appendix table 8) suggest that the financial position of the sector as a whole is improving, especially relative to the early 1980's.

Farm Sector Returns and Cash Flow

Rising farm sector asset values, returns to assets, and cash flow have enhanced farmers' ability to service debt out of current earnings and have raised returns to farm assets and equity. In 1987, returns to farm assets rose faster than farm real estate values and the rate of return on farm assets from current income increased to 6.0 percent. The rate of return on equity from current income rose to 4.9 percent. For 1988, both the rate of return on assets and the rate of return on equity from current income are expected to fall somewhat (appendix table 1).

Rising residual income to farm assets and rising farm asset values led to real capital gains in 1987. The projected total real rate of return on assets, which includes both returns from current income and from real capital gains, is expected to be between 4 and 5 percent in 1988. This reflects modest increases in both land prices and in returns to farm assets.

Table 9--Farm balance sheet components (excluding households), by State, December 31, 1987

State	Assets			Liabilities			Proprietors' equity	Debt-to-asset ratio
	Real estate	Nonreal estate	Total	Real estate	Nonreal estate	Total		
	Million dollars							
Alabama	6,943	2,376	9,318	842	701	1,543	7,776	16.6
Alaska	187	221	407	19	9	28	379	6.9
Arizona	7,596	1,189	8,785	645	997	1,642	7,143	18.7
Arkansas	9,155	3,368	12,522	1,629	1,347	2,975	9,546	23.8
California	41,162	8,749	49,911	7,225	5,244	12,468	37,442	25.0
Colorado	11,684	3,754	15,438	1,730	1,330	3,061	12,377	19.8
Connecticut	1,774	257	2,032	78	92	170	1,863	8.3
Delaware	1,107	235	1,343	140	125	265	1,079	19.7
Florida	19,574	2,909	22,483	2,431	985	3,415	19,067	15.2
Georgia	10,179	3,487	13,667	1,634	1,415	3,049	10,618	22.3
Hawaii	3,603	390	3,993	239	102	341	3,652	8.5
Idaho	7,559	2,846	10,405	1,450	1,011	2,461	7,944	23.7
Illinois	30,582	8,844	39,426	4,753	2,613	7,366	32,060	18.7
Indiana	14,787	5,819	20,606	3,185	1,586	4,771	15,835	23.2
Iowa	28,400	12,566	40,965	6,043	3,657	9,700	31,264	23.7
Kansas	16,658	7,627	24,285	2,616	2,749	5,364	18,921	22.1
Kentucky	10,061	4,364	14,424	1,680	975	2,654	11,769	18.4
Louisiana	6,303	2,534	8,836	1,031	1,179	2,210	6,626	25.0
Maine	1,551	459	2,009	115	204	319	1,690	15.9
Maryland	4,296	1,214	5,511	528	334	862	4,650	15.6
Massachusetts	1,832	348	2,180	67	146	212	1,968	9.7
Michigan	8,440	4,091	12,531	1,713	1,286	2,999	9,532	23.9
Minnesota	15,713	9,947	25,661	4,030	2,942	6,972	18,689	27.2
Mississippi	8,249	3,063	11,311	1,510	1,458	2,968	8,343	26.2
Missouri	15,959	7,362	23,319	2,812	1,832	4,644	18,675	19.9
Montana	9,524	3,550	13,075	1,866	1,005	2,871	10,204	22.0
Nebraska	16,565	8,163	24,728	3,153	3,044	6,197	18,531	25.1
Nevada	1,595	485	2,081	233	87	321	1,760	15.4
New Hampshire	866	148	1,015	32	30	62	953	6.1
New Jersey	4,410	483	4,893	214	131	345	4,549	7.0
New Mexico	5,543	1,375	6,918	638	408	1,046	5,873	15.1
New York	7,066	3,817	10,882	899	1,296	2,195	8,687	20.2
North Carolina	10,100	3,374	13,474	1,499	1,161	2,660	10,813	19.7
North Dakota	11,276	5,289	16,565	1,853	1,769	3,622	12,943	21.9
Ohio	14,135	5,878	20,013	2,041	1,236	3,277	16,736	16.4
Oklahoma	12,814	5,237	18,051	2,024	2,018	4,042	14,009	22.4
Oregon	7,476	2,649	10,125	1,713	691	2,404	7,721	23.7
Pennsylvania	13,431	4,345	17,776	1,245	936	2,181	15,596	12.3
Rhode Island	393	37	431	13	11	24	406	5.7
South Carolina	4,081	1,580	5,660	608	443	1,051	4,610	18.6
South Dakota	7,869	5,411	13,279	1,525	1,807	3,332	9,947	25.1
Tennessee	11,740	4,015	15,756	1,080	929	2,009	13,747	12.8
Texas	58,449	14,175	72,624	5,347	5,374	10,721	61,902	14.8
Utah	4,417	1,084	5,499	439	303	741	4,758	13.5
Vermont	1,838	605	2,443	166	129	295	2,148	12.1
Virginia	9,627	2,879	12,506	1,060	739	1,799	10,706	14.4
Washington	9,977	3,053	13,030	1,662	1,171	2,833	10,197	21.7
West Virginia	1,707	664	2,370	180	88	267	2,103	11.3
Wisconsin	9,740	8,510	18,251	2,734	2,395	5,129	13,122	28.1
Wyoming	4,634	1,497	6,131	421	382	803	5,327	13.1
U.S. Total	522,627	186,321	708,943	80,786	61,900	142,685	566,258	20.1

Table 10--Farm business assets (excluding households), by State and lender, December 31, 1987

State	Physical assets					Financial assets			Total assets
	Real estate		Nonreal estate			Currency	Demand deposits	Investments in cooperatives	
	Land	Service structures	Livestock and poultry	Machinery and motor vehicles	Crops				
	Million dollars								
Alabama	6,561	382	738	971	135	45	109	378	9,318
Alaska	175	12	7	18	0	4	3	189	407
Arizona	7,332	264	519	384	117	11	50	108	8,785
Arkansas	8,642	513	895	1,427	313	50	155	528	12,522
California	39,258	1,904	3,078	2,974	541	169	614	1,373	49,911
Colorado	11,077	607	1,632	1,130	387	38	115	452	15,438
Connecticut	1,531	243	66	103	22	5	23	38	2,032
Delaware	991	116	27	117	29	4	12	46	1,343
Florida	18,964	610	974	957	45	51	161	721	22,483
Georgia	9,569	610	815	1,221	174	67	159	1,051	13,667
Hawaii	3,529	74	91	143	0	8	24	124	3,993
Idaho	7,148	411	938	1,113	500	26	78	191	10,405
Illinois	29,471	1,111	1,563	4,273	1,535	131	284	1,058	39,426
Indiana	13,918	869	1,064	2,657	894	88	192	924	20,606
Iowa	26,804	1,596	3,644	5,131	1,836	95	307	1,553	40,965
Kansas	15,988	670	2,911	3,007	813	60	207	629	24,285
Kentucky	9,140	921	1,232	1,788	565	94	210	475	14,424
Louisiana	6,126	177	522	1,285	235	40	119	333	8,836
Maine	1,255	296	82	217	89	8	19	44	2,009
Maryland	3,915	381	240	570	139	25	56	184	5,511
Massachusetts	1,540	292	51	140	19	12	20	106	2,180
Michigan	7,624	816	875	2,176	363	68	177	432	12,531
Minnesota	14,492	1,221	2,071	4,583	1,389	89	236	1,579	25,661
Mississippi	7,845	404	614	1,296	365	57	123	608	11,311
Missouri	15,123	836	2,338	2,849	828	92	331	924	23,319
Montana	9,193	331	1,471	1,274	425	32	87	261	13,075
Nebraska	15,945	620	3,117	3,125	1,111	63	201	546	24,728
Nevada	1,505	90	264	104	61	6	15	35	2,081
New Hampshire	750	116	35	74	13	2	8	16	1,015
New Jersey	4,130	280	63	227	31	12	67	83	4,893
New Mexico	5,346	197	680	355	74	17	50	199	6,918
New York	5,763	1,303	1,159	1,583	405	52	136	482	10,882
North Carolina	9,210	890	609	1,706	173	60	205	621	13,474
North Dakota	10,703	573	1,112	2,247	750	48	120	1,012	16,565
Ohio	13,156	979	1,225	2,717	724	131	267	814	20,013
Oklahoma	12,379	435	2,288	1,844	306	84	223	492	18,051
Oregon	6,965	511	789	1,121	189	65	126	359	10,125
Pennsylvania	11,503	1,928	1,392	1,605	619	72	129	528	17,776
Rhode Island	355	38	5	16	1	1	4	10	431
South Carolina	3,786	295	316	653	121	32	72	386	5,660
South Dakota	7,473	396	2,114	1,742	930	60	94	471	13,279
Tennessee	10,961	779	1,138	1,631	335	94	256	561	15,756
Texas	56,919	1,530	6,568	3,984	1,166	278	688	1,491	72,624
Utah	4,208	209	467	378	101	17	39	82	5,499
Vermont	1,521	317	192	258	55	8	21	71	2,443
Virginia	8,767	860	849	1,107	273	67	164	419	12,506
Washington	9,343	634	807	1,394	278	43	144	387	13,030
West Virginia	1,546	161	228	278	61	20	47	30	2,370
Wisconsin	8,092	1,648	2,881	3,529	881	77	192	950	18,251
Wyoming	4,443	191	824	375	117	16	29	136	6,131
U.S. Total	491,982	30,646	57,579	73,855	20,533	2,694	7,176	24,489	708,943

Table 11--Real estate debt outstanding (excluding households), by State and lender, December 31, 1987

State	Federal Land Banks	Farmers Home Adm'str'n	Life insurance companies	Commercial banks	CCC storage facility	Individuals and others	Totals
Million dollars							
Alabama	381	115	59	162	.68	123	842
Alaska	8	1	4	2	.00	5	19
Arizona	138	69	150	131	.01	158	645
Arkansas	485	312	260	347	1.40	223	1,629
California	3,087	233	1,744	628	.27	1,533	7,225
Colorado	796	132	247	127	.74	428	1,730
Connecticut	34	14	3	11	.01	17	78
Delaware	65	17	1	30	.02	26	140
Florida	910	127	549	462	.43	382	2,431
Georgia	726	212	143	367	1.07	184	1,634
Hawaii	137	30	29	31	.00	11	239
Idaho	571	271	207	26	1.32	373	1,450
Illinois	1,758	352	520	1,090	2.73	1,031	4,753
Indiana	968	320	309	692	1.58	895	3,185
Iowa	1,676	462	636	937	5.70	2,326	6,043
Kansas	1,121	287	242	477	.53	489	2,616
Kentucky	364	290	159	550	.51	315	1,680
Louisiana	405	172	173	171	.69	110	1,031
Maine	28	65	0	4	.12	17	115
Maryland	260	50	13	68	.09	136	528
Massachusetts	21	21	0	8	.03	17	67
Michigan	831	207	46	202	1.60	424	1,713
Minnesota	1,665	381	260	489	6.22	1,229	4,030
Mississippi	535	308	197	291	.76	177	1,510
Missouri	736	411	244	732	1.35	688	2,812
Montana	665	199	266	87	.50	648	1,866
Nebraska	1,026	410	460	511	2.36	743	3,153
Nevada	86	22	61	3	.01	61	233
New Hampshire	11	6	3	3	.00	9	32
New Jersey	92	25	1	21	.07	75	214
New Mexico	219	74	72	110	.06	163	638
New York	340	169	15	115	1.39	257	899
North Carolina	773	287	40	215	.31	184	1,499
North Dakota	892	365	44	199	.86	353	1,853
Ohio	667	199	151	542	1.20	480	2,041
Oklahoma	815	374	129	305	.34	401	2,024
Oregon	578	132	348	39	.27	615	1,713
Pennsylvania	443	142	17	387	.45	256	1,245
Rhode Island	6	3	0	3	.00	2	13
South Carolina	369	105	20	48	.22	65	608
South Dakota	489	419	71	125	1.38	419	1,525
Tennessee	280	253	42	335	.98	169	1,080
Texas	1,971	400	732	1,048	.62	1,195	5,347
Utah	179	62	11	27	.29	158	439
Vermont	47	47	0	38	.06	34	166
Virginia	569	103	23	198	.44	166	1,060
Washington	561	166	342	167	.59	425	1,662
West Virginia	36	48	18	51	.04	26	180
Wisconsin	948	323	71	670	5.42	717	2,734
Wyoming	98	58	92	25	.04	148	421
U.S. Total	29,867	9,249	9,231	13,307	45.71	19,086	80,786

Table 12--Nonreal estate debt outstanding (excluding households), by State and lender, December 31, 1987

State	Commercial banks	Production Credit Associations	Federal Int Credit Banks	Farmers Home Adm'str'n	Individuals and others	Total	CCC commodity loans
Million dollars							
Alabama	170	140	.0	209	182	701	19
Alaska	7	0	.0	0	2	9	0
Arizona	543	155	2.6	161	135	997	21
Arkansas	373	146	5.3	554	268	1,347	114
California	2,351	1,360	13.3	605	915	5,244	121
Colorado	666	156	20.6	120	367	1,330	278
Connecticut	22	37	.0	11	22	92	0
Delaware	27	42	.0	8	48	125	4
Florida	298	221	.2	227	239	985	3
Georgia	250	151	.3	770	244	1,415	40
Hawaii	22	44	.0	11	25	102	0
Idaho	516	109	.3	218	168	1,011	186
Illinois	1,642	187	.6	316	467	2,613	1,912
Indiana	794	168	.0	298	326	1,586	674
Iowa	2,182	162	1.3	610	702	3,657	2,561
Kansas	1,791	134	.6	230	592	2,749	557
Kentucky	360	170	.0	289	155	975	89
Louisiana	216	134	4.5	708	116	1,179	64
Maine	27	48	.0	96	33	204	1
Maryland	65	137	.0	34	99	334	14
Massachusetts	63	48	.0	13	21	146	0
Michigan	419	315	.0	350	203	1,286	248
Minnesota	1,400	486	3.4	580	472	2,942	1,773
Mississippi	274	103	23.3	901	156	1,458	95
Missouri	911	155	.0	483	284	1,832	383
Montana	499	80	.2	322	104	1,005	295
Nebraska	1,901	109	.0	342	692	3,044	1,871
Nevada	18	40	.0	12	17	87	0
New Hampshire	2	16	.0	3	8	30	0
New Jersey	20	48	.0	30	32	131	5
New Mexico	160	72	.1	65	110	408	52
New York	559	284	.0	268	185	1,296	52
North Carolina	252	302	.0	301	305	1,161	55
North Dakota	726	295	2.0	576	169	1,769	845
Ohio	474	226	.0	263	272	1,236	326
Oklahoma	1,071	115	20.9	566	246	2,018	85
Oregon	317	123	.4	126	124	691	110
Pennsylvania	274	279	.0	136	247	936	22
Rhode Island	2	5	.0	1	3	11	0
South Carolina	60	64	.0	238	80	443	17
South Dakota	887	100	.0	620	199	1,807	559
Tennessee	230	185	.0	342	172	929	74
Texas	2,546	813	51.2	1,119	845	5,374	514
Utah	90	117	7.0	39	50	303	10
Vermont	27	48	.0	22	32	129	0
Virginia	184	228	.0	185	143	739	17
Washington	791	51	.1	134	196	1,171	267
West Virginia	25	11	.0	27	25	88	2
Wisconsin	869	641	6.3	526	354	2,395	351
Wyoming	211	46	.4	58	67	382	12
U.S. Total	27,589	9,106	165.0	14,123	10,916	61,900	14,695

Cash flow after interest (\$1982) in 1987 and 1988 is forecast to rise to about \$40 billion from the 1984-86 average of \$28 billion. Growth in real cash flow after interest to levels earned in the 1970-71 pre-boom period reflects decreased capital expenditures and lower interest expenses.

Debt/net cash flow and debt/returns to farm assets are expected to decline further in 1987 and 1988. This suggests that farmers may be in a stronger financial position than at any time in the last several years. Overall, farmers are getting their balance sheets in order, paying off debt, and financing purchases with available cash.

FARM FINANCIAL CONDITIONS, JANUARY 1, 1988

- The Farm Costs and Returns Survey at the beginning of 1988 showed the proportion of farms with debt to asset ratios above 0.40 fell from 22 percent to 15 percent during 1987.
- Five percent of all farm businesses were in a vulnerable financial position at the beginning of 1988 (negative net farm income and debt/asset ratios above 0.40). This was a significant improvement over the previous year when 10 percent of farm operators were in this position.

The strongest improvement occurred for farms with gross receipts of \$40,000 to \$99,999; those located in the Southern Plains, Delta, and Corn Belt; and farms having cash grain, cotton, and vegetable, fruit or tree nut production specialties. Farms in the largest economic class, and in the Lake States, Pacific, and Mountain regions had the highest proportion in a vulnerable position, as well as the lowest proportion in a favorable financial position.

- The FCRS suggests that 101,000 farms were in a vulnerable financial position as this year began compared to 204,000 a year earlier.
- The Corn Belt and Lake States combined had nearly two-fifths of all farmers who were in a vulnerable position. The majority of stressed operations continued to be livestock and cash grain farms.
- Farms in a vulnerable financial position owed between 16 and 27 percent of total farm operator debt depending on the net income measure used. This compared to between 25 and 35 percent a year earlier.

The largest share of debt owed by operators in a vulnerable position is held by commercial banks (35 percent) followed by Federal Land Banks (19 percent) and the Farmers Home Administration (19 percent).

SUMMARIZING FINANCIAL CONDITIONS OF U.S. FARMS, JANUARY 1, 1988

The most dramatic change in the past few years has been the turnaround in the solvency position of farms. Higher net incomes have helped operators reduce or pay off debt and provide more farms with enough capital to avoid new debts. Increases in land values, which represent two-thirds of total assets, have also reduced debt/asset ratios.

At the beginning of 1988, 5 percent of farms had debt/asset ratios above 0.70 compared with 9 percent a year earlier. The share owed by these farms fell from 33 to 23 percent. The new data also showed a decline in the proportion of farms and debt in the 0.40 to 0.70 debt/asset ratio category. However, there was an increase in the share of farms in the 0.01 to 0.40 category and those with no year-end liabilities. Not surprisingly, there is a direct relationship between debt/asset position and economic size of farms. Only 16 percent of farms in the highest economic class had no beginning year debt compared with nearly 60 percent of farms that had less than \$10,000 in gross receipts. Almost 30 percent of farms in the largest economic class had debt/asset ratios above 0.40 compared with 10 percent for operations having less than \$10,000 in gross farm earnings.

Farm operators had assets valued at \$584.6 billion and debts totaling \$88.5 billion; an average debt/asset ratio of 0.15. A year before the average debt/asset ratio was 0.22. Average debt/asset ratios continued to exhibit wide variation across different classifications of farms. Farms with gross receipts above \$500,000 had average debt/asset ratios of 0.23, while on the smallest farms the ratio was 0.07. The largest year-to-year reductions in average debt/asset ratios occurred for farms with gross receipts above \$40,000. These farms are more likely to incur debt than the smaller operations. Cash grain, cotton, poultry, and dairy farms were the only production specialties with average debt/asset ratios above the U.S. value. Average debt/asset ratios have declined for all production specialties except nursery or greenhouse operations. The highest average debt/asset ratios occurred in the Lake States, Corn Belt, and Northern Plains. These regions also had the highest average ratios at the beginning of 1987.

Number of Profitable Farms Increases

As 1988 began, nearly 80 percent of farms were profitable based on net farm income. This was almost 10 percentage points higher than the previous year. In addition, a larger share of operators was able to meet cash commitments out of current income.

The share of farms with positive net farm income was nearly constant across economic classes, while the percentage improvement from a year earlier increased as farm sales

Figure 12

Distribution of Farm Income by Debt/Asset Ratio and Economic Class

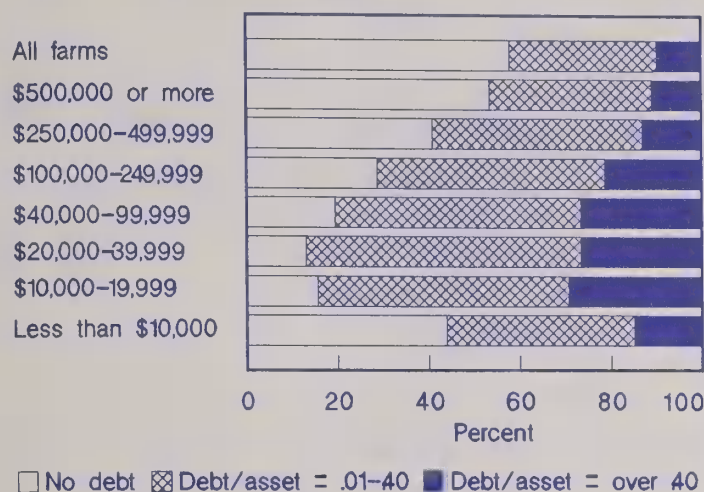
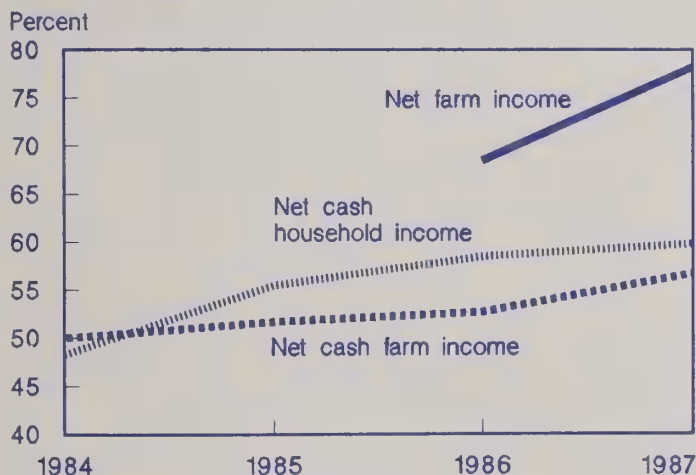


Figure 13

Distribution of Farms with Positive Net Incomes



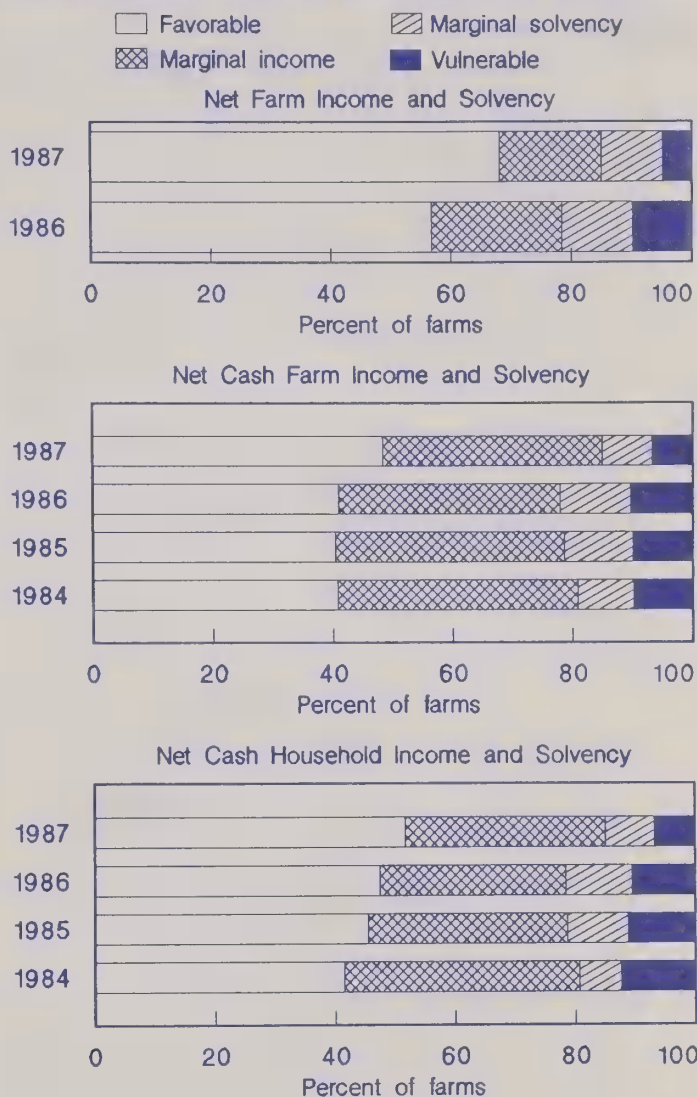
Net farm income data not available prior to 1986.

declined. Poultry, nursery or greenhouse, and tobacco producers were the highest proportion with positive net farm income. Nursery or greenhouse operations were the only specialty units with fewer profitable farms. In contrast, producers of vegetables, fruits, or tree nuts, demonstrated the strongest improvement. The Corn Belt, Appalachian, and Delta regions showed the highest proportion of profitable farms, while the Southern Plains, Delta, and Mountain regions demonstrated the greatest improvement.

Some 57 percent of farms had positive net cash incomes, up from 53 percent the previous year. Most of the improvement was among smaller economic classes, but the proportion with positive net cash farm income was generally less for these farms. More than two-thirds of cash grain, cotton,

Figure 14

Distribution of Farm Operators by Combined Net Income and Solvency Position



poultry, and dairy farms had positive net cash farm income. In contrast to other regions, fewer than half of the operations in the Northeast, Southeast, Southern Plains and Pacific regions were in this category. These regions also have a large share of small, part-time farming operations.

Unlike the other income measures, the proportion of farms with positive net cash household income was virtually unchanged this year. The share of other livestock farms with negative net cash household income increased by 10 percentage points, while dairy operations showed the largest improvement in their position. Appalachia was the only region where at least half of all farms did not have a positive return. Fewer off-farm employment opportunities and higher estimated family living requirements resulted in a somewhat smaller share of farms in the Lake States, Northern Plains,

Year	No debt		Debt/asset ratio					
	Farms	Farms	Debt	Farms	Debt	Farms	Debt	
	Percent							
1987	44	41	45	10	31	5	23	
1986	39	40	33	13	34	9	33	
1985	40	39	34	13	33	9	33	
1984	na	na	38	12	33	7	29	

All combinations of net income and debt/asset ratio show that the financial performance of farms has improved. How much occurred depends on the income measure used. The most dramatic improvement occurred when using net farm income and solvency criteria. The share of farms in a

Item	Financial position			
	Favorable	Marginal income	Marginal solvency	Vulnerable
Percent of farms				
All farms	68	17	10	5
Economic class:				
More than \$250,000	59	14	20	7
\$40,000 - \$250,000	64	12	17	6
Less than \$40,000	71	19	6	4
Type of farm:				
Cash grain	65	14	14	7
Tobacco	78	9	11	5
Cotton	65	11	15	9
Other field crops	65	17	10	7
Vegetable, fruit, nut	71	16	9	3
Nursery or greenhouse	80	12	6	2
Beef, hog, sheep	70	20	7	3
Poultry	73	6	16	6
Dairy	63	12	20	5
Other livestock	58	30	5	7
Region:				
Northeast	68	22	7	3
Lake States	59	19	15	7
Corn Belt	71	12	13	5
Northern Plains	64	17	15	5
Appalachia	76	16	5	3
Southeast	73	18	6	4
Delta	72	16	8	4
Southern Plains	69	20	11	4
Mountain	64	20	10	6
Pacific	67	18	9	7
Acres per farm				
Operating:				
Acres owned	256	289	236	328
Acres operated	417	482	541	584
Dollars per farm				
Average land value	547	558	425	432
Years				
Operator age	55	52	42	44
Ratios:				
			Ratio	
Debt to asset	0.07	0.10	0.64	0.67
Return on assets	.06	-.07	.15	-.08
Cash expenses/gross income	.66	1.23	.70	1.22
Interest/gross income	.04	.10	.11	.24

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FINANCIAL CATEGORIES

Income and solvency measures are combined to classify farm businesses into one of four categories of financial health. For example, a farm has favorable income status if it has positive income and a favorable solvency status if its debt/asset ratio is less than 0.40. Neither income nor debt/asset position alone provides adequate information to evaluate the financial performance of a farm. A high debt/asset ratio is acceptable if the farm or ranch generates enough income to service debt and meet other financial obligations. Alternatively, even low debt levels can be a problem if incomes are consistently insufficient to meet financial obligations including debt service. The following classification system provides a perspective on the proportion of farm businesses and households that face financial stress.

- Favorable—positive income, debt/asset ratio less than 0.40. These farms are in good short-term financial positions and considered financially stable.
- Marginal income—negative income, debt/asset ratio less than 0.40. They generally face an income problem.
- Marginal solvency—positive income, debt/asset ratio above 0.40. These farms are generating positive returns, despite higher debt repayment requirements.
- Vulnerable—negative income, debt/asset ratio above 0.40. These farms are highly leveraged and have income deficiencies that limit their viability as farm businesses.

favorable situation increased from 57 percent in 1986 to its current value of 68 percent, while the proportion of vulnerable farms dropped from 10 to 5 percent. This measure can only be calculated for the last 2 years. Distributions of farms using net cash farm income and debt/asset ratios are available back to 1984. They suggest relative stability at the upper and lower extremes of financial performance categories between 1984 and 1986. However, from the beginning of 1987 to the beginning of 1988, the percentages

of farms in a favorable position went from 41 to 49 percent and the share of farms in a vulnerable situation declined from 10 to 7 percent. Net cash household income and solvency combinations indicate a gradual improvement in the overall financial standing of farm households since 1984. This income measure, in contrast to net cash farm income, provides a more complete assessment of debt service capability since business and family consumption and debt service obligations are deducted from gross cash income from both farm and nonfarm sources. At the beginning of 1988, 52 percent of farms were in a favorable financial position by this income measure compared to 48 percent a year earlier. The proportion of farms in a vulnerable net cash household income and solvency standing fell from 11 to 7 percent.

Table 14 shows differences among farms in the four financial categories. Information developed by economic class indicates that a higher absolute and relative percentage of farm operators in the largest classes were in a vulnerable financial position.

Cotton, other field crop, other livestock, and cash grain farms had the largest proportion in this situation. Moreover, while cash grain operations accounted for 22 percent of all farms, they represented 29 percent of those in a vulnerable position. Livestock farms accounted for about half of the farms in this condition, but 60 percent of all farms. These data illustrate the generally favorable 1987 enjoyed by livestock producers, while the reduction in gross receipts and net earnings hurt grain producers.

Compared with other regions, the Lake States, Pacific, and Mountain regions had the largest share of financially troubled farms. As during 1986, the Northeast and Appalachia had the lowest percentage in this position. The largest reduction from a year earlier occurred in the Northern Plains, Corn Belt, and Lake States.

Operators in marginal solvency and vulnerable categories were younger than average and ran larger farms as measured by acreage. They also owned a smaller share of the acreage they operated than farms in a stronger financial position. Financial ratios showed that producers in a relatively weak financial position generally were more highly leveraged, had lower returns on assets, and had expense-to-income ratios which indicate that operating expenses (particularly interest) consume the farm's earnings. Interest expense required a fourth of 1987 gross income of vulnerable farms as opposed to 10 percent or less for other financial categories. Highly leveraged farms with relatively strong earnings continued to generate the highest returns on assets.

As shown in tables 15 and 16, average farm characteristics vary considerably among regions or sales classes. The Corn Belt has the greatest number of farms but the Mountain region has the largest farms in terms of acres operated. Average gross cash income per farm is highest in the Pacific region and lowest in Appalachia. By sales class the greatest number of farms fall in the smallest category of less than \$10,000. For commercial farms (generally classified as having more than \$40,000 in sales), most farms are in the \$40,000 to \$100,000 range.

WHAT IS THE FARM COSTS AND RETURNS SURVEY?

The Farm Costs and Returns Survey (FCRS) is an annual, national survey conducted by the National Agricultural Statistics Service (NASS), USDA. Over 25,000 farmers and ranchers are contacted in February and March about the previous year's agricultural activity.

The FCRS is a complex multiframe, probability-based survey. Because the FCRS is a probability sample, each respondent represents a number of other farms of a similar size and type. Estimates based on a sample differ from data that would have been obtained if a complete enumeration had been taken. These differences result from sampling variability. Variation that occurs by chance because of population sampling can be measured to provide a perspective on the reliability of the data. In addition, survey estimates are subject to nonsampling errors. Steps are taken to minimize nonsampling errors by pretesting survey forms, training survey statisticians and enumerators on survey design, content, and use, and by comprehensive data editing and analysis at both the State and national levels.

The FCRS provides detailed information on the financial characteristics, tenure, business organization, capital expenditures, production expenses, receipts, resource base, and production practices of farms and ranches throughout the United States. In addition to the data for farm businesses, a limited set of data is obtained for the farm operator and the farm household. These data include characteristics such as age, education, number of dependents, primary occupation, and nonfarm income. The survey not only supports more accurate sector estimates of farm income and commodity costs of production, but also supports analyses of distributional aspects of costs and farm structure for sector participants.

GENERAL ECONOMY

Paced by 16-percent real export growth and 11-percent growth in business plant and equipment spending, the general economy grew at an annual rate of 3.3 percent in the first half of 1988. Other indicators confirm the strength of the current expansion, which will celebrate its sixth birthday in December. At more than 83 percent, capacity utilization is at an 8-year high, and at less than 5.5 percent, the civilian unemployment rate is hovering near a 14-year low. The outlook is good for continued growth through the next 6 months. Export growth, though not likely to keep up its torrid first-half rate, is still likely to be strong due to the steep declines in the value of the dollar since 1985. This growth is likely to continue to stimulate plant and equipment spending, industrial production, and manufacturing employment. The Index of Leading Economic Indicators, which tends to foreshadow general economic trends, points to moderate growth in the next 6 months, although the Index has been volatile since the October stock market decline.

Despite the surge in the general economy, inflation remains moderate. Excluding food and energy prices so as to better measure general inflation trends, consumer prices grew at a 4.7-percent annual rate during the first 6 months of the year. This compares with a 4.4-percent average rate since 1983. Consumer energy prices, heavily influenced by changes in crude oil prices, fell at a slight 0.5-percent annual rate during the first 6 months of the year, helping to offset the 4.2-percent increase in consumer food prices. Overall, the consumer price index rose 4.4 percent in the first 6 months of the year, compared with 4.2 percent for all of 1987.

Inflation is likely to remain moderate over the next 6 months for three main reasons. First, despite some upswing in consumer food prices due to the drought, food accounts for only about 16 percent of overall consumer spending. And, although the exact share varies by product, raw commodity prices, where most of the drought-induced price increases will be felt, typically account for only a small portion of the price consumers pay. Labor and marketing costs tend to account for a greater share of consumer food costs. Therefore, it is unlikely that the drought will substantially drive up overall consumer prices for a sustained period.

Second, crude oil prices remain weak, and although oil price forecasts are very uncertain, current indications suggest continued weakness.

Finally, the recent stabilization of the dollar will reduce upward pressure on import prices, helping to hold down consumer price increases.

Table 15--Characteristics of farm operators on January 1, 1988, by production region

Item	Northeast	Lake States	Corn Belt	Northern Plains	Appalachia	Southeast	Delta	Southern Plains	Mountain	Pacific
Farms operated:										
Sample	834	1,120	1,836	1,315	1,560	1,181	885	1,225	1,124	1,122
Number	132,674	195,419	358,743	147,278	227,362	113,400	84,785	183,118	100,404	128,603
Percent of U.S.	7.94	11.69	21.46	8.81	13.60	6.78	5.07	10.95	6.01	7.69
Percentage of farms in region operated by:										
	Percent									
Corporation	1.77	1.66	2.80	3.05	1.52	3.57	1.48	1.65	5.28	3.40
Partnership	7.93	6.35	5.73	6.94	5.85	4.78	5.40	5.95	8.75	8.53
Individual	90.31	91.99	91.31	89.99	92.46	91.61	93.09	92.38	85.95	87.95
Cooperative	na	na	.16	.03	.17	.04	.03	.02	.02	.12
Acreage operated per farm:										
	Acres									
Owned	130	175	162	564	123	160	157	389	967	146
Cash rented	39	70	64	291	37	78	85	245	410	113
Share rented	3	15	95	208	23	7	77	79	110	56
AUM rented	0	0	0	5	0	0	0	10	1,359	295
Total operated, less AUM	177	252	311	1,021	185	252	324	704	1,456	325
Acreage harvested per farm:										
Corn	15	41	75	53	13	10	3	4	7	1
Wheat	3	11	9	135	4	6	14	33	83	22
Soybeans	6	24	75	34	16	18	68	1	0	0
Cotton	0	0	0	0	2	10	17	21	4	4
Other grains	5	12	5	60	1	1	22	13	31	8
Other crops	41	41	22	72	23	27	22	27	71	27
Total harvested	71	129	186	354	59	71	147	101	196	63
Per farm:										
	Dollars									
Assets	466,124	284,710	304,667	367,442	223,360	336,039	326,674	386,101	520,472	499,205
Debt	42,112	62,971	56,329	74,715	24,047	40,327	41,116	38,792	83,944	79,864
Cash operating expenses	51,171	52,148	50,553	73,963	27,797	60,086	51,406	39,151	70,468	88,398
Gross cash income	67,613	66,601	71,819	103,688	39,752	71,918	68,557	48,126	85,555	108,266
Percentage of U.S.:										
	Percent									
Livestock sales	10.29	15.37	20.35	14.23	7.59	5.07	3.35	8.54	7.39	7.82
Crop Sales	4.14	7.84	22.37	8.88	8.47	8.40	5.39	4.39	8.52	21.59
Government Payments	1.49	13.49	34.23	19.66	3.62	3.47	4.72	8.11	7.33	3.89
Off farm income	8.09	9.61	19.06	5.68	13.84	7.37	5.48	15.49	5.54	9.83
Farm operator average:										
Age (years)	52	49	52	51	54	54	54	55	52	55
Hours worked per week	38	43	34	42	25	26	29	30	36	28
Percentage of operators in region operated by:										
	Percent									
Farming	54.50	65.80	65.45	81.62	50.81	54.44	57.50	55.28	58.75	50.89
Hired manager	.30	.62	.96	.61	2.71	.67	2.83	1.03	1.09	1.31
Other	45.20	33.59	33.58	17.77	46.48	44.89	39.67	43.69	40.17	47.80

na = Not available. Source: 1987 Farm Costs and Returns Survey, USDA.

Table 16--Characteristics of farm operators on January 1, 1988, by sales class

Item	\$500,000 or over	\$250,000 to \$499,999	\$100,000 to \$249,999	\$40,000 to \$99,999	\$20,000 to \$39,999	\$10,000 to \$19,999	\$9,999 or less	All farms
Farms operated:								
Sample	923	1,292	2,627	2,265	1,281	1,063	2,751	12,202
Number	28,479	66,826	198,657	254,701	195,985	194,130	733,007	1,671,786
Percent of U.S.	1.70	4.00	11.88	15.24	11.72	11.61	43.85	100.00
Percentage of farms in sales class:					Percent			
Corporation	24.19	11.68	5.39	2.34	1.09	1.31	.76	2.49
Partnership	32.19	21.66	11.33	7.93	7.26	3.72	2.71	6.44
Individual	43.17	66.66	83.24	89.74	91.65	94.89	96.41	91.00
Cooperative	.46	.00	.04	na	na	.08	.12	.08
Acres operated per farm:					Acres			
Owned	1,259	791	505	399	268	197	79	263
Cash rented	1,097	569	330	154	90	46	12	125
Share rented	231	286	223	112	49	17	2	68
AUM rented	798	469	327	152	43	48	2	106
Total operated, less AUM	2,549	1,623	1,045	659	396	252	91	448
Acres harvested per farm:								
Corn	162	179	89	42	17	8	2	30
Wheat	117	135	80	45	20	7	1	27
Soybeans	149	143	86	46	20	8	1	29
Cotton	65	21	15	5	1	1	0	5
Other grains	59	56	42	22	9	4	1	13
Other crops	182	97	71	49	33	25	11	34
Total harvested	734	631	382	210	100	52	16	140
Per farm:					Dollars			
Assets	2,096,995	995,604	584,896	379,587	317,329	269,147	178,813	349,710
Debt	486,342	223,030	118,427	63,883	31,642	22,204	12,782	52,897
Cash operating expenses	828,585	238,711	110,188	54,128	28,948	15,809	7,020	53,304
Gross cash income	1,113,218	331,171	155,018	74,850	36,584	17,229	4,290	70,196
Percentage of U.S.:					Percent			
Livestock sales	28.27	18.15	26.85	16.07	5.01	2.79	2.86	100.00
Crop Sales	31.33	19.48	26.20	13.73	5.06	2.37	1.84	100.00
Government Payments	10.21	21.31	36.30	21.65	5.98	2.92	1.63	100.00
Off farm income	2.41	4.44	6.98	9.92	12.15	14.24	49.86	100.00
Farm operator average:								
Age (years)	49	47	48	49	53	55	55	53
Hours worked per week	57	60	57	51	37	30	18	33
Percentage of operators in sales class:					Percent			
Farming	90.78	93.56	93.26	84.66	71.90	57.07	36.37	60.27
Hired manager	4.74	1.76	1.41	1.56	1.99	1.43	.54	1.19
Other	4.48	4.67	5.33	13.78	26.12	41.50	63.09	38.54

na=Not available. Source: 1987 Farm Costs and Returns Survey, USDA.

Interest Rates Reflect Real Growth and Moderate Inflation

Interest rates rose during the second quarter, responding to the rapid real growth of the first half and some tightening by the Federal Reserve. Three-month Treasury bill rates rose from an average of 5.7 percent in March to 6.7 percent in July. Long term rates have risen too. Ten-year Treasury bond rates increased nearly 60 basis points from March, to an average of 9.1 in July. While data on interest rates facing agricultural borrowers are somewhat limited, recent experience suggests that rising rates in the general economy drive up rates facing agricultural borrowers. Bank lending rates have mimicked the trend of rising interest rates. The bank prime rate, now at 10 percent for major New York banks, averaged 8.5 percent in March, and is at a 3-year high.

Interest rates are likely to be stable or rise slightly over the next 6 months. With real growth holding near 3 percent, and inflation likely to remain moderate, a key factor in the interest rate outlook will be the stance of the Federal Reserve. The recent hike in the discount rate, the rate the Federal Reserve charges financial institutions that borrow from it, underscores the announced intentions to forestall future inflation by slowing rapid spending growth. With the Federal Reserve willing to tighten to avoid higher inflation, continued rapid growth will put upward pressure on interest rates. Should real growth slow slightly, interest rates would stabilize over the next 6 months.

The major risk to the interest rate outlook is that some unforeseen inflationary surprise would force the Federal Reserve to tighten credit more severely. This would force interest rates up and dampen the growth of the rest of the economy. Slowing growth in the rest of the economy would likely slow demand for agricultural products, while rising interest rates would directly raise borrowing costs to the farm sector. Barring this somewhat unlikely outcome, developments outside the agricultural sector are likely to buoy demand for agricultural commodities while pushing up interest rates and manufactured good input prices only slightly.

TAX ISSUES

How Will Farm Taxable Income be Affected by the Drought?

The drought has disrupted normal production and marketing patterns which could cause wide fluctuations in farm taxable income. For some farmers, the culling of livestock and the receipt of crop insurance proceeds or disaster payments could result in a bunching of income in 1988 and a subsequent increase in taxable income and tax liability. However, the tax code provides flexibility in how farmers treat receipts from crop or livestock sales due to drought.

Sales of Livestock

In general, gain from the sale of dairy and breeding livestock may be deferred if similar replacement livestock are acquired within a 2-year period. In addition, gain from the sale of livestock other than breeding and dairy livestock may be delayed until the following tax year.

The sale or exchange of livestock held for breeding or dairy purposes in excess of the number farmers would sell under normal circumstances is treated as an involuntary conversion. This entitles farmers to replace them with similar stock within a 2-year period and not recognize any gain until the replacement livestock are sold.

It is not necessary that an area be declared a drought area, only that the livestock were sold solely because of it. For example, if a farmer normally culls 10 dairy cattle a year but due to the drought sells 30 in 1988, the gain on the additional 20 cattle may be deferred if within 2 years of the sale, the farmer replaces the 20 dairy cattle with similar livestock.

A farmer who uses the cash method of accounting may also elect to defer income from other livestock sold because of drought until the next taxable year. It is not necessary that the livestock be raised or that the sale take place in a drought area, only that the sale occurred solely because of drought conditions which caused the area to be designated as eligible for assistance by the Federal Government. The amount of gain that may be deferred is equal to the excess of the number of livestock sold due to drought over the amount the taxpayer would have sold under normal business circumstances. To determine the amount eligible for deferral, the total income from the sale of livestock must be divided by the total number of livestock sold. This number is then multiplied by the excess number of livestock sold on account of drought.

For example, a farmer who normally sells 30 beef cattle in a year but, due to the drought, sells 100 head in 1988, could defer the gain on 70 head until 1989. Assuming total income from the sale was \$50,000, \$35,000 of this amount could be deferred until 1989 under the special treatment for livestock sales due to the drought.

Crop Insurance Proceeds and Disaster Payments

Farmers who receive crop insurance proceeds or disaster payments may include them in the year following the damage if they can demonstrate that the income would normally have been reported in a later tax year. Thus, farmers who normally treat CCC loans as loans and thus report income in later years or who normally sell their crop the following year would be eligible for such deferral.

Farmers have an additional option with respect to losses attributable to drought. A loss in an area determined by the President to warrant Federal assistance under the Disaster

Relief Act of 1974 is allowable as a deduction for the tax year immediately preceding the year in which the disaster losses actually occurred. Thus, a farmer with insufficient taxable income in 1988 to fully utilize such losses may apply them to taxes paid in 1987.

WHAT IS NET FARM INCOME AND WHY DOES IT FLUCTUATE?

by

Roger P. Strickland and Robert P. Williams*

Abstract: Net farm income indicates the status and trend in the earnings of farm operators. It is a production-oriented measure reflecting the sector's contribution to the national economy. The characteristics and limitations of this important income indicator are discussed, the composition of key components are explained, and the reasons for year-to-year fluctuations are analyzed. Finally, additional income measures that complement net farm income are identified.

Keywords: Agricultural finance, farm income

The U.S. Department of Agriculture's estimate of net farm income is the indicator most utilized and quoted as the barometer of the income situation of U.S. farmers. Dating from 1910, this long, historically rich data series is an important but not all-encompassing measure of the farm sector's earnings. There are other, perhaps less well known financial measures that complement net farm income as indicators of the economic conditions of farm operators.

Net Farm Income Defined

To properly use net farm income as a financial indicator *per se* or as data for analysis, the user needs to understand precisely what economic attributes are measured by it. Net farm income as estimated by USDA is a measure of the net value of goods and services produced by farm operators within a calendar year. The series is designed for conceptual consistency with the U.S. Department of Commerce's (USDC) National Income and Product Accounts (NIPA). USDA's net farm income measure is the basis for the U.S. Department of Commerce's net farm income measure to proprietors and corporations, which are components of NIPA. The USDC does make a few adjustments prior to incorporation in its accounts (Strickland, 1983, p.3).

Net farm income is a measure of the net value of production—i.e. value added to the national economy—including services provided to farm households, by farms. It is also equivalent to the economic returns (accrued regardless of whether consumption or marketing has occurred) to factors owned and contributed by farm operators. Net farm income

is the value of production, excluding that used as a production input on the farm where produced, less expenses incurred in generating the resulting goods and services. It includes the value of all production within the calendar year, whether sold or unsold, and excludes the effects of sales of commodities produced in prior years.

Net farm income also incorporates the value of services originating from the asset base associated with farming, including the housing services (shelter) received by operators and farm workers from residences located on farms (an imputed value), custom work performed with an operator's equipment (if not operated as a separate business), and income from the use of farm real estate resources for recreational purposes (fishing, hunting, camping, etc.). It also includes Government transfer payments authorized under farm programs and paid directly to farmers in cash or otherwise. Earnings from off-farm work by operators, their families, and farm workers are not included in net farm income.

The empirical methodology followed in estimating net farm income is not entirely consistent with the conceptual definition of value added, but the estimated value of net farm income is not likely to differ substantially. A principal difference between USDA's income accounting and the value added approach is that the latter requires that inputs be accounted for when consumed rather than when purchased.

In essence, under the value-added concept, stocks of inputs in inventory at the beginning of the year are added to the cost of production and the value of ending-year inventories is deducted. The two accounting transactions yield a net change in inventories of inputs. If inventories are drawn down, consumption exceeds purchases; if inventories increase, consumption is less than purchases. When producers

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maintain similar patterns in consecutive years regarding the purchase of inputs prior to the year in which used, the inventory transactions should be substantially offsetting.^{1/}

Another inconsistency between the theoretical concepts defining value added and net farm income is in the inclusion of a capital formation account for items such as breeding herds and buildings. However, this would largely involve a separate accounting for items currently treated as work in progress and included in sales, expenses, and inventory changes. For example, currently the cost of producing or purchasing additional breeding animals is included as expenses. The animal contributes a positive value to inventories while maintained in the breeding herd, and then is included in cash receipts and subtracted from the inventory when sold.

Currently, data are not available to permit measurement and valuing of work in progress. In all likelihood, the net effects of the separate accounting would be small, accruing primarily from the building component where expenses for maintenance, improvement, and interest on debt are included but outlays for purchases or new construction are omitted.

Sources of Variability

Changes in income indicators originate from both expenses and revenues, but the causes and patterns are quite different. Prior to 1985, the change in production expenses was consistently upward, with the exception of 1983, when USDA's Payment-in-Kind (PIK) program achieved significant reductions in acres planted to major crops. With 1985, a reversal in the upward trend occurred. Since then, changes in revenues have been up and down in a random pattern and frequently have been weather related (table 17).

Macroeconomic forces are the principal causes of the multiyear trends evident in production expenses. Intermediate product expenses—purchased nondurable inputs—are a major contributor to the trends in expenses, and price inflation is a principal culprit in determining both the direction and the magnitude of change (table 18). A second major source is interest expenses, which are driven by the rates at which farmers borrow money in financial markets that are increasingly national and even international in scope and competition for funds.

By 1985, the worsening financial conditions of U.S. farmers resulted in a reversal of trends, as farmers implemented cost reduction measures and began slashing debt outstanding substantially. In addition, the rate of inflation declined, dampening price increases, while interest rates dropped substantially. In 1986 and 1987, Federal legislation

^{1/} Data on the timing and rate of consumption and use of inputs are generally not available, nor readily collectible. In contrast, the date, quantity, and value of input purchases are well documented and easily collected

contributed to a reduction in acres being planted to major crops, which lowered the purchase of production inputs.

Weather is frequently a primary cause of the more random fluctuations in gross receipts, due to the sensitivity of crop yields to temperatures and rainfall. Supply and demand—such as the supply from competing producer countries, the cattle production cycle, and the demand for red meat—also cause multi-year trends for specific commodities or commodity groups.

This discussion will focus on the gross income side because, in comparison with the expense side, it is the source of more variability and of more interplay among its components. In accounting for the net value of commodity production within a calendar year, the possible dispositions under the farm income concept are to sell it, use it on the farm where produced (as human food, livestock feed, or seed), or add it to inventory.

Receipts

Within USDA's income accounts, commodity sales are reflected in cash receipts estimates. The cash receipts accounts contain two types of transactions, open-market sales and new Commodity Credit Corporation (CCC) actions involving the placement and redemption of loans with that agency. The placement of commodities under a CCC loan is and has historically been treated as a sale and added to open-market sales in determining cash receipts.

CCC Loans

The reason for considering the CCC transaction as a sale is that it is the *farmer's decision* whether to repay the funds and reclaim the commodity. The transaction is essentially a sale with an option to repurchase. The downside risk on market prices is shifted to CCC and the rights to potential future benefits from upside price movements are retained by the farmer.^{2/}

The treatment of CCC loans, however, is a technical issue having no effect on net farm income because the commodities would be added to farmer-owned inventories if not included in sales. Commodities reclaimed via redemptions of CCC loans are treated as being sold within the crop year at monthly average market prices, and an accounting is made in the open market component of cash receipts. An offset

^{2/} This treatment of nonrecourse loans is consistent with that of the Internal Revenue Service, which does not treat nonrecourse financing as loans because money protected against loss through nonrecourse loans is not considered at risk. (See IRS Publication 536, entitled *Net Operating Losses and the At-Risk Limits*.)

Table 17--Net farm income of U.S. farm operators, 1980-87

Item	1980	1981	1982	1983	1984	1985	1986	1987P
Million dollars								
Total gross income	149,274	166,322	163,504	153,053	174,886	166,248	159,833	169,766
Cash receipts	139,737	141,616	142,594	136,567	142,436	144,015	135,102	138,094
Livestock	67,991	69,151	70,257	69,438	72,966	69,842	71,548	76,218
Crops	71,746	72,465	72,338	67,129	69,469	74,173	63,554	61,876
Open-market sales	71,295	69,384	63,257	67,893	70,194	62,599	55,302	60,189
Net CCC loans	451	3,081	9,081	-749	-816	11,814	8,310	-1,057
Government payments	1,286	1,932	3,492	9,295	8,430	7,704	11,813	16,747
Other farm income	2,273	2,475	4,533	4,500	4,383	5,042	5,107	5,556
Noncash income	12,278	13,811	14,267	13,541	13,380	11,844	10,628	9,990
Value of inventory change	-6,300	6,488	-1,382	-10,851	6,257	-2,357	-2,818	-622
Corn component	-3,602	2,750	413	-7,254	5,312	-99	-718	-600
Production expenses	133,139	139,444	139,978	140,375	142,669	133,957	122,336	123,502
Net farm income	16,135	26,878	23,526	12,678	32,217	32,291	37,497	46,264
Net cash income	34,199	32,779	37,843	36,871	38,685	46,580	51,393	57,060
Less depreciation	17,847	19,612	20,148	19,918	19,213	17,407	15,810	14,420
Business income	16,352	13,167	17,695	16,953	19,472	29,173	35,583	42,640
1977=100								
Index of:								
Crop production	101	117	117	88	111	117	108	106
Prices received by farmers								
All crops	125	134	121	128	139	120	106	105
Meat animals	156	150	155	147	151	142	195	163

P = Preliminary

Table 18--Annual change in net farm income of U.S. farm operators, 1979-87

Item	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87P
Million dollars								
Total gross income	-1,445	17,048	-2,818	-10,451	21,833	-8,638	-6,415	9,930
Livestock income	-765	107	174	-550	2,208	-3,342	2,059	5,100
Cash receipts	-1,245	1,160	1,106	-819	3,528	-3,124	1,706	4,670
Inventory change	480	-1,053	-932	269	-1,320	-218	353	430
Crop income	-2,302	14,560	-7,065	-14,947	20,769	-3,693	-11,433	88
Cash receipts	9,453	719	-127	-5,209	2,340	4,704	-10,619	-1,678
Inventory change	-11,755	13,841	-6,938	-9,738	18,429	-8,397	-814	1,766
Government payments	-89	646	1,560	5,803	-865	-726	4,109	4,934
Other farm income	35	202	2,058	-33	-117	659	65	449
Noncash income	1,676	1,533	456	-726	-161	-1,536	-1,216	-638
Production expenses	9,834	6,305	534	397	2,294	-8,712	-11,621	1,166
Cash expenses	7,368	4,147	-468	715	3,073	-6,383	-9,552	2,708
Intermediate product expenses	4,071	560	-3,195	2,067	190	-3,849	-6,423	2,766
Interest expenses	3,104	3,481	1,864	-420	-287	-2,335	-1,725	-1,326
Other cash expenses	193	106	863	-932	3,170	-199	-1,404	1,268
Noncash expenses	2,147	2,075	689	-432	-737	-2,312	-2,002	-1,481
Net farm income	-11,279	10,743	-3,352	-10,848	19,539	74	5,206	8,767
Net cash income	786	-1,420	5,064	-972	1,814	7,895	4,813	5,667
Ratio								
Expense/gross income ratio	-681	37	-19	-4	11	101	181	12

P = Preliminary

equal to the loan repayment is made in the CCC component of cash receipts. Thus, for ■ unit of commodity reclaimed from CCC, the net effect of the repayment and subsequent marketing transactions is the difference between the loan rate and market prices. In cases where loans are repaid, there are three transactions in the income accounts—loan placement, loan redemption, and open-market sales. The latter two are largely offsetting and all three may or may not occur within a single calendar year. If the loan is not redeemed during the option period, then the loan placement is the sole transaction (Strickland, 1981). If not redeemed, an additional accounting for the commodity occurs in the Government sector accounts, rather than farm sector accounts.

On-Farm Use

Quantities used on the farm where they are produced are not accounted for, at least not directly, in either sales or inventory changes. However, unsold quantities used in production processes are eventually reflected in increased net farm income, because of the use of farm-produced inputs in lieu of purchased inputs. Examples would be use of farm-grown commodities for feed and seed. Quantities consumed by farm residents are valued at current market prices and included as a component of gross receipts.

Inventories

Quantities of commodities remaining unsold and unused at yearend are added to inventory and valued at calendar year average market prices. The objective is to derive the value of the change in quantity rather than the change in value of total stocks within the year. Annual market prices (weighted by monthly sales) are used to mitigate the effects of significant changes in prices from beginning to end of year in order to eliminate the effects of windfall or speculative gains and losses on inventories resulting from price changes rather than production.

Additions to inventories represent any new production and thus are included as increments to gross and net farm income. Reductions in inventories during the calendar year represent the sale or consumption of commodities produced and accounted for in prior years and are included to offset the sales of corresponding commodities in the current year. Commodities taken from beginning-year inventories and sold or used for feed and seed are reflected in cash receipts but are offset by a negative inventory adjustment (Strickland, 1983).

Crop Production Variability

The statistics in the first of the accompanying tables exemplify the net value of production attributes of the net farm income measures. It is particularly instructive to look at the

reasons for major year-to-year changes in net farm income (table 18). With the exception of 2 years, livestock production has proven to be relatively stable, and the associated prices exhibit similar stability. There are occasional exceptions, one of which was identified above and about which more will be said.

Crop production, on the other hand, frequently experiences substantial year-to-year variation. It is greatly affected by weather and Government production control programs. The relationship between movements in net farm income and crop production and prices can be seen in a comparison between the income series and the USDA's indexes of annual crop production and prices received by farmers (table 16). The relationship is masked somewhat in 1976-78 by the rising livestock prices, but since 1978 the direction and magnitude of change in net farm income and the crop production index are readily observable. The similar effects of the summer droughts in 1980 and 1983 on both measures are quite apparent.

Importance of Corn

Of all commodities, corn production is most often the major causal factor in movements of net farm income. Corn generally ranks first among crops in receipts, its production is highly dependent on favorable weather at critical stages and it is often the focus of Government production control efforts because of recurring inventory buildups. Corn production reached new highs in 1978, 1979, 1981, 1982, and 1985; was just below the record level in 1986; and then fell 14 percent in 1987, due in part to Government programs structured to entice farmers to reduce plantings and to ensure that production not covered by USDA programs received less protection from market forces.

Corn production was reduced substantially by droughts in 1980 and 1983. In 1983, the combined effects of a reduction in planted acreage in response to USDA-administered programs, including PIK, and ■ widespread summer drought lowered corn production to 4.2 billion bushels, 51 percent of that harvested in 1982 and 47 percent of the 1984 harvest.^{3/} Net farm income in 1983 was 43 percent below 1982 and 60 percent below 1984.

The effects of corn production fluctuations on the crop production index can be seen in table 16. Its corresponding effects on net farm income components in 1979-81 and 1983-4 are easily discernable. The record 1982 corn crop following the record 1981 crop caused market prices to drop considerably prior to harvest. Because of the relatively low market price facing farmers, much of the crop was placed with CCC. The net result was a 15-percent fall in 1982 net farm income.

^{3/}Corn yields are ■■ indicator of the effects of past meteorological conditions on the production of summer crops

Corn frequently accounts for over half or more of the total change in farm inventories. A prime example is 1983, when corn production fell by 49 percent from the previous year and the resulting drawdown in corn inventories accounted for 67 percent of the decline in the value of total inventories. Again in 1984, a 55-percent jump in corn production accounted for 79 percent of the value of all inventory buildup.

Livestock Income

Between 1976 and 1979, cattle producers reduced their herds an average 16 percent, causing prices to rise. The resulting large increases in cattle prices contributed significantly to corresponding increments in net farm income for 1978 and 1979. However, these were the only instances in the past 12 years where changes in livestock prices or production contributed substantially to year-to-year changes in net farm income.

The only other instances since 1970 in which livestock receipts underwent year-to-year changes of 10 percent or more were 1972-74. In that period, receipts for all categories of livestock first moved up and then down together in an apparent response to the macro-inflationary forces that were affecting all commodities, both agricultural and nonagricultural.

Since 1979, livestock income has been quite stable. A downward trend in the herd size is evidenced by the frequent negative change in the value of inventories, but this liquidation of capital stock is not reflected in the income figures. The negative inventory adjustment offsets the corresponding increment to sales.

Complementary Income Measures

Net cash income, another income measure estimated and published by USDA, tends to be less frequently quoted than net farm income. Net cash income is a function of all cash transactions (and share rent), including total sales, regardless of the year produced. It does not account for noncash items such as imputed rental value of residences, depreciation, and products consumed and used on farm where produced.

This measure is an indicator of earnings generated by the farm firms' production enterprises (excluding the operators' households) using any and all available resources and strategies to have money available for repayment of loans and other essential expenditures. Net cash income was high in 1983 because of record sales from commodity stocks unsold at the beginning of the year. This was in contrast to net farm income, which was at a 12-year low.

In 1984, both income measures were at record levels due to high prices, crop production, and Government payments. In 1978-84, net cash income ranged only from \$33 to \$39 billion, while the corresponding range for net farm income was \$13 to \$32 billion. Net cash income moved to a higher plateau in 1985-87, reflecting farmers' needs to substitute earnings for loans in maintaining cash flow and solvency in the face of falling land values.

Most farmers, in deriving their taxable income from the farm business, follow the cash accounting method rather than the accrual accounting used by most nonfarm business. Under the cash accounting method, receipts from market sales are totaled and then deductions are made for purchases of production inputs and for a depreciation allowance reflecting capital consumption. A conceptually comparable estimate can be derived at the national and State level by reducing net cash income by a depreciation allowance. This measure of business income (table 17) tends to parallel net cash income because the capital stock underlying depreciation has not changed dramatically until recently.

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Effects of Commodity Options on Crop Producers' Revenue Risk: Implications for Lenders

by

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Abstract: Effects of buying put options on soybean producers' revenue risks were evaluated with a stochastic simulation model. Compared with selling forward, put options offer farmers higher probabilities of slightly below-average revenues, lower probabilities of slightly above-average revenues, and higher probabilities of large revenues. In certain situations, lenders may wish to encourage the borrower to lock in a price with futures or cash forward contracts and give up the chance for extraordinarily high returns that options offer. Options avoid the problem of raising funds to meet margin calls.

Keywords: Commodity options, forward pricing, cash sales at harvest, risk-management techniques, margins, agricultural finance.

Changing Government programs, uncertain yields, and export demand fluctuations contribute to commodity price variability. Farmers' interest in alternative pricing methods heightens with a rise in price variability because of the potential for greater revenue risk. Each method confronts producers with a different set of risks.

Agricultural commodity options and minimum-price cash contracts offer some promising new ways to shift price risks and reduce revenue uncertainty. Since farm lenders stand to benefit from measures that reduce the revenue risks faced by their borrowers, lenders share with farmers an interest in these additional risk-shifting tools.

Commodity options are traded only on approved exchanges. A commodity option is a standardized contract that gives the buyer (holder) the right, but not the obligation, to buy or sell a futures contract at a specified price within a given time period. A call option is a right to buy and a put option is a right to sell.

Minimum-price cash contracts are similar to options, but entered directly between farmers and first handlers of a commodity at the local level. Minimum-price cash contracts set a minimum price for the farmer while allowing a higher price depending upon market conditions; they require the farmer to deliver the commodity. Such contracts can be sized to fit individual needs. They also eliminate basis risk and frequently allow the farmer to borrow the option premium from the first handler.

This article applies to both commodity options and minimum-price cash contracts. To simplify presentation, much of the discussion uses option market terms. However, the examples shown apply most directly to cash contracting since basis risk is disregarded.

Commodity options and minimum-price cash contracts, like commodity futures contracts and fixed-price cash forward contracts, can shift price risks for farmers over limited time periods. Options contracts trade actively for about 6-8 months before maturity, and minimum-price cash contracts cover similar or shorter intervals. Properly used, these contracts can effectively reduce revenue uncertainty over the period of a production loan. Because of their short-term nature, they are not well suited for reducing risks over the longer periods required to repay loans on machinery or land. However, a farmer who can effectively use these short-term risk management tools may be a better candidate for long-term loans as well.

Despite advantages of hedging, indications are that only a relatively small proportion of farmers sell their crops forward in futures (Gill; Leath; Helmuth, pp. 20-41; and Whitacre and Olmstead). Moreover, most lenders apparently do not actively encourage farmers to hedge. For example, Harris and Baker found that loans tended to be larger for East Central Illinois farmers who hedged, but by no more than the margin deposits required for the hedges. Lenders may have been hesitant to finance farmers' margins because of concern that margin calls arising from large futures price movements might cause the lender's legal credit limit or the farmer's self-imposed credit limit to be exceeded.

Commodity options are sometimes misunderstood by producers and their lenders. Examples of possible confusion and misunderstanding include assertions that: (1) options protect against downside price changes without affecting the gains from upside price changes (thus incorrectly implying that options are a way to raise average revenue), and (2) options can overcome the problems that yield risk poses for hedging with futures.

Options offer farmers wider choices among revenue distributions than forward pricing or selling on the spot market at harvest, particularly choices among distributions that are skewed to the right. Single parameter measures of disper-

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sion, such as the variance or standard deviation, are inadequate to compare the effects of using options with other pricing strategies. Thus, skewness must be taken into account. Ideally, the entire revenue distribution should be examined.

This paper compares buying put options with selling forward and selling on the spot market at harvest by describing the effects of each pricing strategy on the distribution of farmers' gross revenues. Implications for lenders are developed from these comparisons.

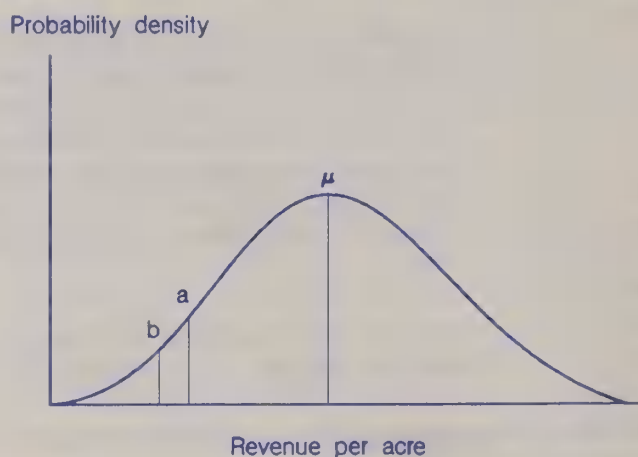
Theoretical Considerations

Risk is present when an activity can result in more than one outcome, the actual outcome is not fully predictable, and some possible outcomes are less desirable than others. A farmer may face risks from many sources, such as weather, prices, future interest rates, disease, insects, fire, and personal injury or illness. These risks, which affect the farmer's well-being directly, all enter into revenue risk. Conceptually, revenue risk can be described by means of a probability distribution which specifies the probabilities of obtaining different levels of revenue. The farmer is particularly concerned about the probabilities of revenues so low as to impede repayment of loans as scheduled or impose financial hardship on his or her family.^{1/}

This analysis focuses on revenue risks as they appear at planting time when decisions frequently are made about contracting. At planting time for a particular year, the farmer's prospective revenue from selling on the spot market at harvest can be described by a hypothetical probability distribution such as that represented by the curve in figure 15. A different distribution of prospective revenues applies each year depending upon supply and demand prospects. Moreover, the distribution changes over the growing season as more information about supply and demand becomes available.

Gross revenue in dollars per acre is measured on the horizontal axis of figure 15. The level of revenue required by the farmer to repay the loan in full without difficulty is equal to (a). Loan repayment would become difficult and refinancing might be required at a level of revenue less than (a). At some critically low level less than (b), the loan would be defaulted. Thus, both the farmer and the lender are concerned with reducing the probability that revenue falls below (a) and especially (b). The expected revenue per acre at planting time is (μ), which approximately equals the

Figure 15
Hypothetical Probability Distribution of Crop Production Revenue with Critical Revenue Levels



expected yield times the expected price. Probabilities of revenues falling within ranges measured on the horizontal axis are measured by areas under the curve. Thus, the area to the left of (a) represents the probability that the farmer's loan will have to be refinanced. In years when price prospects are favorable, the revenue distribution shifts rightward, (μ) lies relatively further to the right of (a), and the probability of revenues being insufficient to repay the loan is less. When price prospects at planting are low, (μ) lies further left relative to (a) and probabilities of financial difficulties are greater.

The objective of buying puts or forward pricing is to obtain a probability distribution of revenues which is preferred to the one for spot sales at harvest. Both farmer and lender prefer distributions with less probability in the range below (a). Some farmers may prefer distributions that are skewed to the right—that offer some probability of extraordinarily high revenues. In contrast, since lenders do not gain directly from revenues above (a), they cannot be expected to attach much importance to the upper tails of farmers' revenue distributions, except as they bear on accumulation of financial reserves for next year's borrowing.

Both the farmer and the lender would prefer to shift the distribution of revenues to the right; that is, to increase average revenue. But neither buying puts nor selling forward can be expected to do this in an efficient market.^{2/}

^{1/} In using forward markets, some farmers may seek not only to shift risks but also to profit directly by taking advantage of anticipated changes in futures prices. This article deals with the simpler case where the current futures price is considered to be the best available price forecast for the farmer. The results are believed to be relevant for many farmers and lenders and can serve as a starting point for those who wish to consider more elaborate pricing strategies.

^{2/} Competition among speculators tends to eliminate profit opportunities in futures and options markets. Most studies have failed to reject the hypothesis that futures prices are "fair" or "unbiased." For example, Grant's data reflected an upward drift of about 5 percent in the futures contract price, but this amount was not statistically significant.

Consequently, the choice of revenue distribution depends upon its other characteristics, such as skewness or dispersion.

Either buying puts or selling forward can concentrate the distribution of revenue about its midpoint, thereby reducing both tails. Indeed, forward selling would completely eliminate revenue risk over the production period if yield risk (and basis risk in the case of hedging in futures) were absent. This would concentrate all of the distribution at the mean. Buying puts tends to truncate the lower tail of the distribution, concentrating the probability therein at a point somewhere to the left of (μ). The upper tail of the distribution would not be truncated, as with selling forward, but merely shifted to the left by an amount sufficient to cover the option premium. Therefore, yield and basis risk prevent futures from concentrating all revenue at the mean and prevent options from completely truncating the lower tail at the mean less the option premium.

Procedure and Assumptions

A stochastic simulation process was used to estimate revenue probability distributions for soybean producers. Soybeans were selected as a representative crop since they generally have not been subject to an effective price support. Three pricing strategies were analyzed: selling on the spot market at harvest, selling on a cash forward market at planting time, and buying put options (minimum price forward contracts) at planting time. For convenience of presentation, these will be called selling spot, selling forward, and buying puts. Choices between different revenue distributions will be made based on a safety-first criterion. This involves choosing the distribution with the lowest probability of revenue below some critical revenue level.

Assumptions built into the base simulation were as follows:^{3/} soybean yields averaged 35 bushels per acre with a standard deviation of 3.5 bushels per acre, a harvest price of \$6.40 expected at planting time, efficient (unbiased) forward markets were assumed (changes in the price for harvest delivery between planting and harvest averaged zero), a standard deviation in price of \$1.28 was assumed plus a -.30 correlation between yields and prices measured as deviations from their respective expected values, and basis risk was assumed to be nonexistent.

The simulation process generated 5,000 random pairs of lognormal harvest prices and yields based upon the above parameters. Price and yield were specified as lognormal

variables, thus making gross revenue at harvest lognormally distributed. The lognormal distribution has a lower limit of zero and no upper limit.

Revenues were computed for each sales strategy from each random drawing's yield-price pair:

$$(1) \text{ Cash sale at harvest} \quad R = YP$$

$$(2) \text{ Forward contract} \quad R = YP + H\hat{Y}(\hat{P} - P)$$

$$(3) \text{ Put options (at-the-money)}^{4/} \quad R = YP + G\hat{Y}(T - M),$$

where $T = S - P$ if $P < S$. Otherwise, $T = 0$.

Variables are defined as follows: R = revenue per acre, Y = realized yield, P = price at harvest, H = proportion of the crop contracted at the forward price (.85)^{5/}, \hat{Y} = yield expected at planting time, \hat{P} = forward price at planting time, G = proportion of crop covered by put options, T = value of put option at harvest, M = premium for put options at planting time, and S = strike price for put options.

Results

Both forward pricing and buying at-the-money puts resulted in revenue distributions with higher and narrower peaks and less probability in the tails than selling at harvest (figure 16). Forward selling produces a somewhat greater concentration of revenues near the midpoint and smaller probabilities in the tails than does buying put options. The two distributions differ in other subtle ways. As expected, buying puts results in higher probabilities of very high revenues than selling forward does.

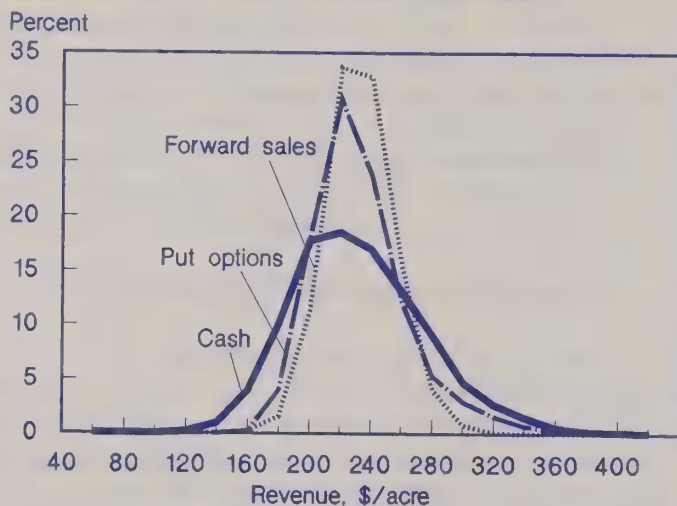
Since the average revenue is approximately the same for the two strategies, the higher probabilities in the upper tail for puts must be balanced by correspondingly higher probabilities of below-average revenues. Thus, the probability of revenues in the \$120 to \$200 range is somewhat higher for puts than for selling forward. Probabilities of extremely low revenues appear to be similar for buying puts and for selling forward, but the evidence is not conclusive on this point.

^{4/} An at-the-money put option guarantees the holder the right to sell a futures contract at current future prices. ^{5/} This fraction approximately equals the minimum risk hedging level as determined by the formula provided by McKinnon. The formula specifies that the minimum risk hedging ratio equals the correlation between price and yield multiplied times (the coefficient of yield variation/the coefficient of price variation), where price and yield are measured as changes from expectations.

^{3/} These assumptions are based on estimates by Grant.

Figure 16

Distribution of Soybean Revenues from Alternative Pricing Strategies--Base

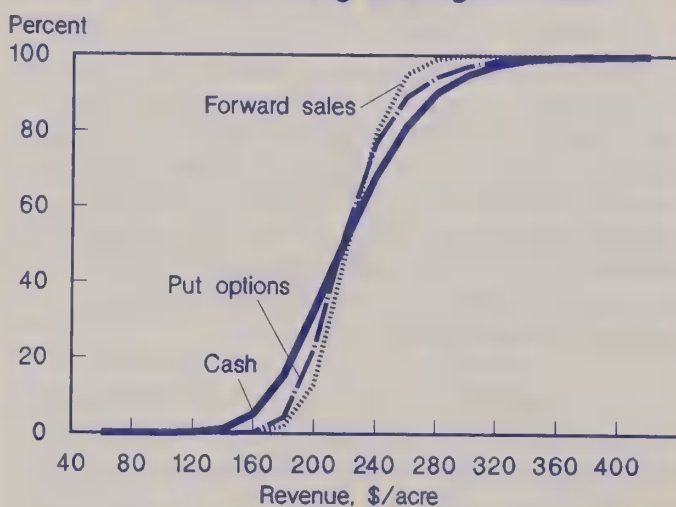


the figure indicates that with spot selling at harvest under the assumptions specified, the probability of revenue less than \$200 per acre is about 32.5 percent, while the probability of revenue less than \$180 per acre is about 15.3 percent. Thus, with the expected price at \$6.40, a farmer requiring only \$200 per acre to repay the loan has a probability of failing to achieve sufficient revenue 32.5 percent of the time, whereas for \$180 per acre the chance of failure is 15.3 percent.

Through forward selling 85 percent of the expected crop, the probability of revenue less than \$200 is reduced from about 32.5 percent to about 13.1 percent, while the probability of revenue less than \$180 is reduced from 15.3 percent to 1.8 percent. The distribution of revenue for the put options strategy generally lies between the other two distributions and closer to the distribution of selling forward. For example, the probability of revenue below \$200 with the put option strategy is 22.3 percent, compared with 13.1 percent for forward selling, and the probability of revenue less than \$180 is 4.2 percent, compared with 1.8 percent for forward selling.

Figure 17

Cumulative Distribution of Soybean Revenues from Alternative Pricing Strategies--Base



The probability of the farmer's revenue falling below critical levels can be shown directly using a cumulative probability function (figure 17). In this figure the height of each point on the curve measures the probability of returns less than the value shown on the horizontal axis. For example,

The main principle illustrated by figures 16 and 17 is that either buying put options or selling forward (cash) reduces the probabilities of revenues that are much lower than planting time expectations. Buying puts gives higher probabilities of slightly below-average revenue than does forward selling. Options produce a probability distribution of revenue that is skewed to the right, but with essentially the same mean as the distribution that results from selling forward.^{6/}

Results for the base case show that buying at-the-money puts resulted in revenue distributions with higher and narrower peaks and less probability in the tails than selling at harvest. In general, buying at-the-money puts produces a somewhat smaller concentration of revenues near the midpoint and greater probabilities in the tails than does selling forward at a fixed price. As expected, buying puts results in higher probabilities of very high revenues than does selling forward. Options fared slightly better than forward contracts in the extreme lower tail, but the difference is very small and probably sensitive to the assumptions about the shapes of the price and yield distributions.

^{6/} Equality of means for the different pricing strategies was imposed by assuming that forward prices are "fair" or unbiased. The question of bias in futures and options pricing has not been fully resolved, but is beyond the scope of this study.

Sensitivity Tests

The sensitivity of these findings was tested relative to increased price variability, to increased yield variability, and to options with different strike prices that are in and out-of-the-money. Individual parameters were altered and the simulations were rerun.

Increased price variability: (Standard deviation of price was increased by 100 percent from \$1.26 to \$2.56 per bushel.) The cash distribution of revenue is more dispersed relative to the base cash distribution, thereby increasing the probability of outcomes in either tail. The position of the cash forward pricing distribution did not change much from the base scenario nor did the probabilities of not achieving the two critical revenue levels. Put options became much more expensive and thus the mode or peak of their revenue distribution was shifted leftward (figure 18) compared with the base case (figure 16), even though the mean was unchanged (table 19).

With increased price variability, put options do not provide the maximum protection against downside revenue risk. Instead, fixed-price forward contracts achieve the lowest probability (13.1 percent) of revenues falling below a level of \$200 per acre, compared with 22.3 percent for put options or 32.5 percent for cash sales at harvest (table 20).

Increased yield variability: (Standard deviation of yield was increased 100 percent from 3.5 to 7.0 bushels per acre.) With extreme yield variability, all three pricing strategies provided about equal probability of revenues falling below the critical level (figure 19 and table 20). When yield variability was increased to 7 bushels per acre, the optimal hedge ratio dropped to .3 from .85 with the base case scenario. However, fixed forward pricing provided a slightly lower probability of revenues falling below \$160 to \$200 per acre.

Figure 18

Distribution of Soybean Revenues from Alternative Pricing Strategies--Base with Price Variability = \$2.56

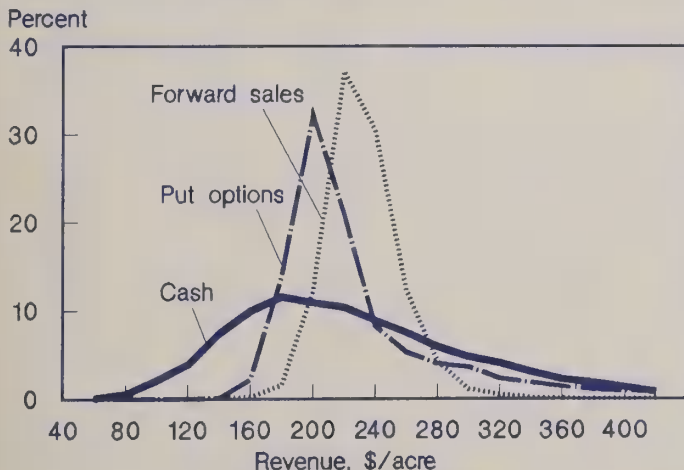


Figure 19

Distribution of Soybean Revenues from Alternative Pricing Strategies--Base with Yield Variability = 7 Bushels

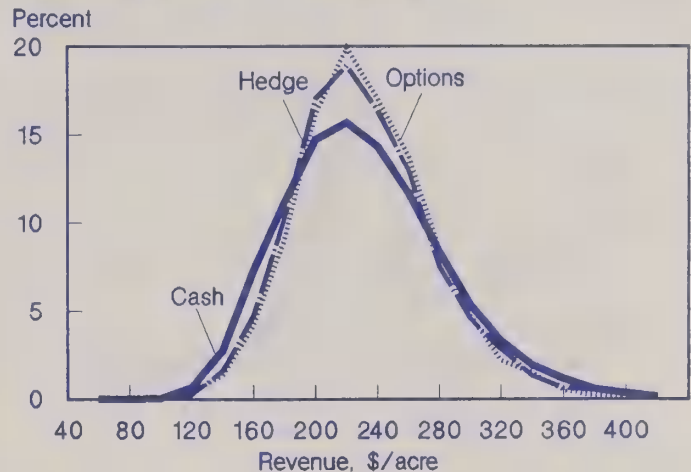


Table 19--Revenue distribution statistics based on simulation results

Scenario	Average	Std. Dev.	Skewness
Dollars/acre			
Base			
Cash	223.02	43.67	.58
F-P FWD Contract	222.99	21.61	.21
Put Option (at-money)	222.89	31.48	1.23
Base + Price Variability = \$2.56			
Cash	221.88	84.78	1.19
F-P FWD Contract	221.75	23.22	.69
Put Option	220.69	60.24	2.50
Base + Yield Variability = 7 bu.			
Cash	222.03	52.81	.68
F-P FWD Contract	222.00	43.30	.37
Put Option	221.95	46.07	.73
Options			
In-the-money \$7.00	222.94	27.39	1.13
At-the-money \$6.40	222.89	31.47	1.23
Out-the-money \$5.80	222.85	36.21	1.10

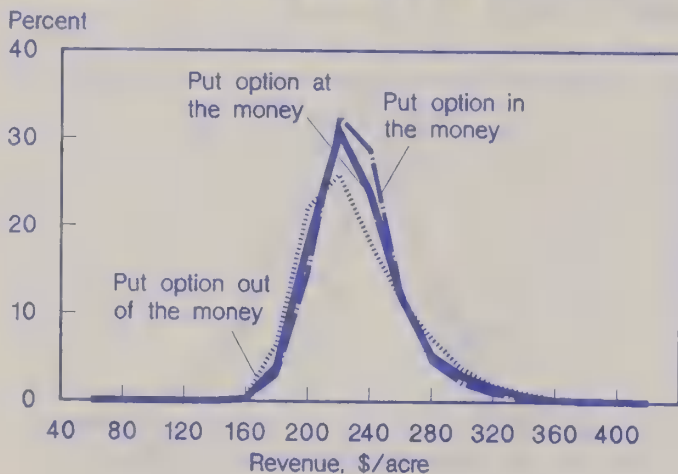
Variation in option strike prices: The revenue distribution for an in-the-money put option approaches the distribution of a fixed price forward contract, whereas, a distribution for an out-the-money put option approaches a cash sales distribution (figure 20 and table 20). The in-the-money put of \$7.00 per bushel gives the producer the lowest probability of not achieving the critical revenue levels of \$200 or \$180 per acre.

Implications for Lenders

Lending institutions that are more effective in helping farmers manage risk should be stronger competitors in the market for farm loans. A loan protected by a hedge in the futures market, a cash forward sale, a put option, or a minimum price contract should be less risky than an unhedged

Figure 20

Distribution of Soybean Revenues from Alternative Pricing Strategies--Base with Variation in Option Strike Prices



loan. In theory, this should enable the lender to safely increase the amount loaned to the farmer.

In setting policies concerning farm borrowers' use of options and other types of contracts, the lender is primarily concerned with assuring that loans will be repaid on time with interest, and secondarily concerned that borrowers remain financially viable and survive as customers. The borrower's ability to repay the loan generally requires that revenue exceed some critical level. The lender realizes no direct benefit when the farmer's revenue greatly exceeds an amount necessary to repay the loan. This makes the lender particularly interested in the probabilities that lie in the lower tail of the farmer's revenue distribution.

Both minimum-price and fixed-price contracting can provide assurance that revenues actually realized at a later date will be at, near, or above expectations. Contracting reduces risks associated with price changes between the time the contract is entered and the time the product is delivered. However, contracting does not protect against year-to-year variations in prices that prevail at the time when contracts are entered. Consequently, such contracts are important to lenders who provide operating loans over a growing season or feeding period, but of less importance to lenders providing only long-term loans for land and equipment.

In determining which to encourage—fixed-price or minimum-price contracts—the lender needs to weigh the loan repayment risks under each alternative against other considerations. When the futures price or cash forward price at planting time is high enough to offer expected revenues well above the level that would endanger loan repayment, options and traditional forward contracting offer similar levels of protection against the worst price and yield contingencies. However, when forward prices are so low, or the farmer's financial condition so precarious, as to place expected revenues near the critical level, then traditional forward contracts may offer greater assurance of loan repayment than do options. In other words, there may be situations when the lender may wish to encourage the borrower to lock in a price with futures or cash forward contracts and give up the chance for extraordinarily high returns that put options allow.

Since the farmer reduces revenue uncertainty and can, on average, expect to be compensated for the option premium by increased revenue, the lender can safely and advantageously finance option premiums much the same as financing initial margin deposits for hedging in futures. In both cases, the loan contract should assure the lender that the borrower maintains the position until the loan is repaid.

Table 20--Cumulative probability density function based on alternative simulation results

Scenario	Revenue Range Dollars/Acre									
	40	80	120	160	200	240	280	320	360	400
Base	Percent									
Cash	.0	.0	.2	5.1	32.5	68.1	90.2	97.5	99.6	99.9
F-P FWD C	.0	.0	.0	.2	13.1	79.6	99.1	100.0	100.0	100.0
Put Option	.0	.0	.0	.2	22.3	76.9	94.3	98.8	99.8	99.9
Base + Price Variability = \$2.56										
Cash	.0	.6	6.6	24.0	46.4	65.7	79.1	87.9	93.2	96.3
F-P FWD C	.0	.0	.0	.4	14.1	81.7	98.2	99.8	100.0	100.0
Put Option	.0	.0	.0	2.2	48.4	77.6	86.8	92.7	96.0	97.8
Base + Yield Variability = 7 bu.										
Cash	.0	.0	.7	10.7	36.7	66.7	86.8	95.5	98.6	99.5
F-P FWD C	.0	.1	.6	6.1	31.4	68.4	90.7	97.7	99.7	100.0
Put Option	.0	.0	.3	6.6	33.9	69.2	89.7	97.1	99.0	99.8
Options										
Strike Price = \$7.00 (In-the-Money)	.0	.0	.0	.2	17.8	79.0	96.3	99.3	99.8	100.0
Strike Price = \$6.40 (At-the-Money)	.0	.0	.0	.2	22.3	76.9	94.3	98.8	99.8	99.9
Strike Price = \$5.80 (Out-the-Money)	.0	.0	.0	.5	29.2	73.4	92.5	98.2	99.7	99.9

Farmers' use of options or cash contracts avoids the need to finance margin calls. Whereas the lender who agrees to finance a farmer's margin calls makes a commitment that depends upon futures price movements and is essentially unlimited, the lender who finances option premiums makes only a limited commitment that is known in advance. In many cases, this advantage of options could outweigh the slight advantage that selling futures offers in reducing the probabilities of loan default.

Conclusions

In some cases, forward sales are more effective than put options in preventing soybean producers' revenue from falling below critical levels. However, options spare farmers and their lenders the problem of raising funds to meet margin calls. Moreover, some farmers may be willing to give up some downside risk protection to use put options and obtain revenue distributions that are skewed to the right.

The differences between put options and forward sales revenue distributions are magnified by increased price variability and diminished by increased yield variability. Revenue distributions with deep in-the-money put options approach those for forward sales, whereas, distributions for out-the-money put options approach those for cash sales at harvest.

Properly used, either selling forward or buying put options can increase the probability that production loans can be paid off without difficulty. This suggests that lenders should learn more about how options fit into farmers' risk management programs. Lenders may wish to help or encourage farmers to learn to use options as well as futures. This might involve establishing programs or agreements with farmers to finance premiums on approved options transactions as well as margins on futures trades that involve bona fide hedging.

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Appendix table 1--Farm income, assets and debt, and returns 1/

Item	1984	1985	1986	1987	1988F
Billion dollars					
Income and total returns					
1. Gross farm income 2/	163	155	150	161	158 to 162
2. Wages and perquisites to hired labor	9	9	9	9	8 to 10
3. Other operating expenses, excluding interest	80	76	69	72	70 to 76
4. Capital consumption	19	17	16	14	13 to 15
5. Net income from assets and operators' labor and management (1-2-3-4)	55	54	56	64	61 to 65
6. Income imputed to operators' labor and management	27	23	20	22	25 to 27
7. Residual income to assets (5-6)	28	30	36	42	35 to 39
8. Real capital gain to assets	-129	-100	-62	-2	-5 to -7
9. Total return from assets (7+8)	-100	-70	-26	40	30 to 32
10. Interest paid	20	18	16	15	13 to 15
11. Real capital gain to debt	8	5	4	6	3 to 5
12. Total return to equity (9-10+11)	-113	-83	-38	31	20 to 22
13. Real capital gain to assets and debt	-121	-96	-58	4	-1 to -3
14. Residual income to equity (12-13)	8	12	20	27	22 to 24
Balance sheet 3/					
15. Assets	849	748	692	709	720 to 730
16. Debt	191	175	155	143	136 to 144
17. Equity (15-16)	658	574	536	566	580 to 590
Percent					
Rates of return and interest rates					
18. Rate of return on assets (ROA) (7/15)	3.2	3.8	5.0	6.0	4 to 6
19. Real capital gain on assets (8/15)	-14.4	-12.5	-8.6	-3	0 to -1
20. Total real return on assets (18+19)	-11.2	-8.8	-3.6	5.7	4 to 5
21. Av. interest rate paid on debt (10/16)	10.6	9.8	9.8	10.0	9 to 11
22. Real capital gains on debt (11/16)	4.1	2.5	2.4	4.3	2 to 3
23. Real cost of debt (21-22)	6.5	7.3	7.4	5.7	7 to 8
24. Rate of return on equity (ROE) ((7-10)/17)	1.2	2.0	3.6	4.9	3 to 4
25. Real capital gain on equity ((8+11)/17)	-17.2	-15.5	-10.5	-8	0 to -1
26. Total real return on equity (24+25)	-15.0	-13.5	-6.9	5.7	3 to 4
27. Net return on assets (NROA) (18-21)	-7.4	-6.0	-4.8	-4.0	-4 to -5
28. Spread (20-23) 4/	-17.7	-16.1	-11.0	0.0	-2 to -3

F = Forecast. 1/ Numbers may not add due to rounding. 2/ Excludes operator dwellings. 3/ Excludes operator households and CCC activity. 4/ When total real rate of return on assets exceeds total real cost of debt, debt financing is profitable.

Appendix table 2--Farm income and cash flow statement, 1983-88

Item	1983	1984	1985	1986	1987	1988F
Billion dollars						
Farm income sources:						
1. Cash receipts	136.6	142.4	144.0	135.1	138.1	143 to 147
Crops 1/	67.1	69.5	74.2	63.6	61.9	66 to 68
Livestock	69.4	73.0	69.8	71.5	76.2	77 to 79
Cash Government payments	4.1	4.0	7.6	8.1	6.7	6 to 8
Value of PIK commodities	5.2	4.5	0.1	3.7	10.0	7 to 9
2. Direct Government payments	9.3	8.4	7.7	11.8	16.7	14 to 16
3. Farm-related income 2/	4.5	4.4	5.0	5.1	5.6	5 to 7
4. Gross cash income (1+2+3) 3/	150.4	155.2	156.8	152.0	160.4	163 to 168
5. Nonmoney income 4/	13.5	13.4	11.8	10.6	10.0	8 to 10
6. Realized gross income (4+5)	163.9	168.6	168.6	162.6	170.4	172 to 177
7. Value of inventory change	-10.9	6.3	-2.4	-2.8	-.6	-6 to -8
8. Total gross income (6+7)	153.1	174.9	166.2	159.8	169.8	165 to 170
Production expenses:						
9. Cash expenses 5/ 6/	113.5	116.6	110.2	100.6	103.3	106 to 109
10. Total expenses	140.4	142.7	134.0	122.3	123.5	126 to 129
Income statement:						
Net cash income: 1/ 6/						
11. Nominal (4-9)	36.9	38.7	46.6	51.4	57.1	55 to 60
Deflated (1982\$) 7/	35.7	36.0	42.5	45.6	50.0	43 to 47
Net farm income: 1/						
12. Nominal total net (8-10)	12.7	32.2	32.3	37.5	46.3	38 to 43
Deflated (1982\$) 7/	12.2	29.7	29.1	32.9	38.0	34 to 38
Deflated (1967\$) 8/	4.3	10.3	10.0	11.4	13.0	10 to 14
13. Off-farm income	37.0	38.9	42.6	44.6	46.8	48 to 50
Other sources and uses of funds:						
14. Change in loans						
outstanding 6/	3.2	-1.9	-15.6	-19.9	-12.6	-1 to -3
Real estate	2.3	-1.1	-6.0	-9.2	-7.7	-2 to -4
Nonreal estate 9/	0.9	-0.8	-9.6	-10.7	-4.9	0 to -1
15. Rental income and monetary change	5.3	8.9	8.8	7.8	6.8	7 to 9
16. Gross cash flow (11+14+15)	45.4	45.7	39.8	39.3	51.3	61 to 65
17. Capital expenditures 6/	12.7	12.5	9.6	8.6	9.8	9 to 11
18. Net cash flow 1/ 6/ (16-17)	32.9	33.3	30.9	30.9	41.5	50 to 55

F = Forecast. Totals may not add due to rounding. 1/ Includes net CCC loans. 2/ Income from custom work, machine hire, farm recreational activities, forest product sales, and misc. sources. 3/ Numbers in parentheses indicate components required to calculate a given item. 4/ Value of home consumption of farm products and imputed rental value of farm dwellings. 5/ Excludes depreciation and hired labor perquisites. 6/ Excludes farm households. 7/ Deflated by the GNP implicit price deflator. 8/ Deflated by the CPI-U. 9/ Excludes CCC loans.

Appendix table 3--Relationship of net cash to net farm income

Item	1983	1984	1985	1986	1987	1988F
Billion dollars						
Gross cash income	150.4	155.2	156.8	152.0	160.4	163 to 168
Minus: cash expenses	113.5	116.6	110.2	100.6	103.3	106 to 109
Equals: Net cash income	36.9	38.7	46.6	51.4	57.1	55 to 60
Plus: Nonmoney income:						
Gross rental value of dwelling	12.5	12.3	10.9	9.7	9.1	8 to 9
Value of home consumption	1.1	.9	0.9	0.9	.9	0 to 1
Value of inventory change	-10.9	6.3	-2.4	-2.8	-.6	-6 to -8
Minus: Noncash expenses:						
Depreciation & capital consumption	23.9	23.1	20.9	18.9	17.3	16 to 18
Labor perquisites	0.7	0.5	0.5	0.4	.5	0 to 1
Minus: Household expenses						
Interest	0.9	0.9	0.8	0.7	0.6	0 to 2
Taxes	0.3	0.3	0.3	0.3	0.3	0 to 1
Repairs	0.4	0.4	0.5	0.5	0.3	0 to 2
Insurance	0.9	0.9	0.9	0.9	0.9	0 to 2
Equals: Net farm income	12.7	32.2	32.3	37.5	46.3	40 to 45

F = Forecast.

Appendix table 4--Cash receipts, 1983-88

Item	1983	1984	1985	1986	1987	1988F
Billion dollars						
Crop receipts 1/						
Food grains	9.7	9.7	9.0	5.6	5.4	6 to 8
Wheat	8.8	8.6	7.9	4.8	4.9	4 to 6
Rice	0.9	1.1	1.0	0.7	.5	0 to 2
Feed grains and hay	15.5	15.7	22.5	17.0	13.1	11 to 13
Corn	10.9	10.5	16.9	12.5	8.8	7 to 9
Sorghum, barley, and oats	2.5	2.8	3.3	2.4	2.0	1 to 3
Hay (all)	2.2	2.3	2.3	2.1	2.2	1 to 3
Oil crops	13.5	13.9	12.6	10.5	11	12 to 14
Soybeans	12.2	12.2	11.3	9.2	10	10 to 12
Peanuts	.8	1.2	1.0	1.1	1	1 to 2
Cotton lint and seed	3.7	3.3	3.7	2.9	4	4 to 6
Tobacco	2.8	2.8	2.7	1.9	2	1 to 3
Fruits and nuts	6.1	6.8	6.8	6.9	8	7 to 9
Vegetables	8.5	9.1	8.6	8.7	9	8 to 10
Greenhouse & nursery	4.5	5.2	5.5	5.8	6	5 to 7
Other crops 1/	3.4	3.3	3.2	3.4	3	2 to 4
TOTAL CROPS	67.1	69.5	74.2	63.6	61.9	64 to 66
Livestock receipts						
Red meats	38.9	40.8	38.6	39.1	44.7	42 to 46
Cattle	26.7	28.7	27.0	26.9	31.2	30 to 34
Calves	2.0	2.0	2.1	2.0	2.6	1 to 3
Hogs	9.8	9.7	9.0	9.7	10.3	9 to 10
Sheep and lambs	0.4	0.5	0.5	0.5	.6	0 to 2
Poultry and eggs	10.0	12.2	11.2	12.7	11.5	11 to 13
Broilers	4.9	6.0	5.7	6.8	6.2	5 to 7
Turkeys	1.3	1.7	1.8	2.0	1.7	1 to 3
Eggs	3.4	4.1	3.3	3.5	3.2	2 to 4
Other poultry	0.4	0.4	0.4	0.4	.0	-1 to 1
Dairy products	18.8	17.9	18.1	17.8	17.8	15 to 20
Wholesale milk 2/	18.5	17.7	17.8	17.5	17.6	15 to 20
Retail milk	0.3	0.3	0.3	0.3	.3	-1 to 1
Other livestock	1.8	2.0	1.9	1.9	2	1 to 3
TOTAL LIVESTOCK	69.4	73.0	69.8	71.5	76.2	74 to 76
TOTAL RECEIPTS						
Program 3/	136.6	142.3	144.2	135.2	136	138 to 142
Non-program 4/	62.9	62.2	67.6	56.3	53	55 to 60
	73.7	80.2	76.6	78.9	83	80 to 85

F = Forecast. Totals may not add due to rounding. 1/ Includes sugar, seed, and other misc. crops. 2/ Milk receipts do not reflect price deductions levied on marketings. 3/ Receipts from commodities directly supported by farm programs. 4/ Commodities not receiving direct support.

F = Forecast.

Appendix table 5--Farm income distribution by enterprise type 1/

Item	Crop Farms	Cash Grain 2/	Tobacco	Cotton	Fruit, Nut, Vegetables	Livestock Farms	Red Meat	Dairy	Poultry
Number of farms				Thousands					
1986	887	472	80	21	100	1,327	868	229	27
1987	871	463	79	21	98	1,303	852	225	27
1988F	847	451	77	21	95	1,268	829	219	26
1. Cash receipts:				Million dollars					
Crops									
1986	57,172	24,661	1,698	2,921	15,072	6,420	4,961	953	71
1987	54,000	19,000	1,500	3,300	16,000	5,400	4,200	800	100
1988F	59,000	23,000	1,600	4,100	17,000	6,100	4,800	900	100
Livestock									
1986	4,743	3,620	130	48	168	66,765	31,892	19,911	11,866
1987	5,200	4,000	100	50	200	70,000	35,000	20,000	11,000
1988F	5,000	4,000	100	50	200	70,000	36,000	19,000	11,000
2. Direct Gov't payments									
1986	8,423	6,911	52	696	71	3,393	2,503	735	18
1987	12,000	10,000	100	900	100	5,000	4,000	1,000	30
1988F	10,000	8,000	70	700	100	4,000	3,000	800	20
3. Gross cash income 3/									
1986	71,957	36,086	1,906	3,746	15,581	80,012	41,603	21,901	12,145
1987	74,000	35,000	2,000	4,300	18,000	83,000	45,000	23,000	11,000
1988F	76,000	36,000	2,000	5,000	17,000	84,000	46,000	22,000	11,000
4. Cash expenses									
1986	45,191	24,678	1,176	2,462	7,769	54,863	30,226	16,889	3,010
1987	44,000	24,000	1,000	2,000	8,000	55,000	31,000	16,000	3,000
1988F	45,000	24,000	1,000	2,000	8,000	56,000	31,000	17,000	3,000
Net Cash Income:									
5. Current dollars 4/									
1986	26,765	11,407	730	1,284	7,813	25,149	11,377	5,012	9,135
1987	30,000	11,000	700	2,000	9,000	29,000	15,000	6,000	8,000
1988F	30,000	11,000	700	3,000	9,000	28,000	15,000	5,000	8,000
6. Deflated (1982 \$)									
1986	23,458	9,998	640	1,125	6,847	22,041	9,971	4,393	8,006
1987	25,000	9,000	600	1,600	8,500	24,000	12,000	5,000	7,000
1988F	26,000	10,000	600	2,000	8,000	21,000	11,000	4,000	6,000
Balance Sheet:									
7. Farm assets:									
Real estate									
1986	213,218	106,609	9,182	6,988	37,135	296,873	196,538	59,936	6,733
1987	222,000	111,000	10,000	7,000	39,000	309,000	204,000	62,000	7,000
1988F	254,000	142,000	10,000	7,000	39,000	313,000	207,000	63,000	7,000
Nonreal estate									
1986	77,608	50,701	2,107	2,889	8,062	103,874	57,594	33,156	1,620
1987	76,000	50,000	2,000	3,000	8,000	103,000	57,000	33,000	1,600
1988F	75,000	49,000	2,000	3,000	8,000	102,000	57,000	32,000	1,600
8. Total liabilities									
1986	79,574	49,814	1,414	4,963	9,253	75,384	39,217	28,106	1,713
1987	72,000	45,000	1,000	5,000	8,000	68,000	36,000	26,000	1,800
1988F	66,000	41,000	1,000	4,000	8,000	63,000	38,000	23,000	1,700
9. Debt-to-asset ratio					Percent				
1986	27.4	31.7	12.5	50.3	20.5	18.8	15.4	30.2	20.5
1987	24.2	28.2	11.1	45.1	17.6	16.6	13.6	26.8	18.1
1988F	20.1	21.7	10.1	41.0	15.9	15.2	12.4	24.5	16.4

F = Forecast. Numbers may not add due to rounding. 1/ Farms types are defined as those with 50 percent or more of all sales accounted for by a specific commodity or commodity group. 2/ Includes farms earning at least half their receipts from sales of wheat, corn, soybeans, rice, sorghum, barley, oats or a mix of cash grains. 3/ Equals a + b + farm related income. 4/ Equals c - d.

Appendix table 6--Farm production expenses, 1983-88

Item	1983	1984	1985	1986	1987	1988f
Billion dollars						
Farm-origin inputs	33.5	32.8	30.3	28.9	31.0	33 to 37
Feed	21.7	19.9	18.0	16.2	16.1	18 to 20
Livestock	8.8	9.5	8.1	9.7	12.0	12 to 14
Seed	3.0	3.4	3.4	3.0	3.0	2 to 4
Manufactured inputs	20.9	21.5	21.0	17.0	16.8	16 to 19
Fertilizer	7.1	7.4	7.3	5.8	5.4	5 to 7
Fuels and oils	7.5	7.1	6.6	4.8	4.4	4 to 6
Electricity	2.1	2.2	2.2	1.9	2.4	2 to 3
Pesticides	4.2	4.8	5.0	4.4	4.6	4 to 5
Total interest charges	21.4	21.1	18.7	16.9	15.5	14 to 16
Short-term interest	10.6	10.4	8.8	7.8	7.3	6 to 7
Real estate interest	10.8	10.7	9.9	9.1	8.2	7 to 8
Other operating expenses	31.1	31.4	30.6	29.5	30.0	30 to 32
Repair and maintenance	6.5	6.4	6.4	6.4	6.5	7 to 8
Labor expenses	9.7	9.7	9.8	9.9	10.7	10 to 12
Machine hire & custom work	1.9	2.2	2.2	1.8	2.0	2 to 3
Animal health	1.4	1.3	1.2	1.2	1.0	1 to 2
Marketing, storage & trans	3.9	4.0	4.1	3.7	3.8	4 to 5
Misc. operating expenses	7.0	7.1	6.7	6.2	6.0	6 to 7
Other overhead expenses	33.4	35.8	33.2	29.8	29.0	27 to 29
Capital consumption	23.9	23.1	20.9	18.9	17.3	17 to 18
Taxes	4.5	4.1	4.2	4.1	4.3	4 to 5
Net rent to nonoperating landlords	5.1	8.6	8.1	6.7	7	7 to 8
Total production expenses	140.4	142.7	133.9	122.3	123.5	126 to 129
Interest on operator dwelling	0.9	0.9	0.8	0.7	1.0	0 to 2
Taxes on operator dwelling	0.3	0.3	0.3	0.3	0.0	0 to 1
Repairs on operator dwelling	0.4	0.4	0.5	0.5	1.0	0 to 2
Insurance on operator dwelling	0.9	0.9	0.9	0.9	1.0	0 to 2
Labor perquisites (noncash)	0.7	0.8	0.8	0.6	1.0	0 to 2
Noncash & household expenses	3.2	3.2	3.2	3.0	3.0	2 to 4
Cash expenses 1/	113.3	116.3	109.6	100.1	100.0	101 to 105

F = Forecast. 1/ Cash expenses equal total expenses minus depreciation, operator dwelling expenses, and noncash labor benefits.

Appendix table 7a--Balance sheet of the farming sector, excluding operator households, December 31

Item	1983	1984	1985	1986	1987	1988F
Billion dollars						
Farm assets	945.0	848.5	749.0	691.6	708.9	725 to 735
Real estate 1/	739.6	639.6	558.6	510.1	522.6	534 to 544
Livestock and poultry	49.7	49.6	46.3	47.6	57.6	57 to 61
Machinery and motor vehicles	100.8	96.9	87.6	80.3	73.9	78 to 82
Crops stored 2/	23.9	29.6	23.5	19.1	20.5	14 to 18
Financial assets 3/	31.3	32.8	33.0	34.4	34.3	36 to 38
Farm debt	192.7	190.8	175.2	155.3	142.7	132 to 142
Real estate 4/	104.8	103.7	97.7	88.5	80.8	76 to 80
Nonreal estate	87.9	87.1	77.5	66.8	61.9	56 to 60
Total farm equity	752.6	657.7	573.8	536.3	566.3	590 to 600
Percent						
Selected ratios:						
Debt-to-asset	20.4	22.5	23.4	22.5	20.1	17 to 20
Debt-to-equity	25.6	29.0	30.5	29.0	25.2	21 to 24
Debt-to-net cash income	519.2	491.7	370.6	298.1	245.0	230 to 247

F = Forecast. 1/ Excludes value of operator dwellings. 2/ Non-CCC crops held on farm plus value above loan rate for crops held under CCC. 3/ Excludes time deposits and savings bonds. 4/ Includes CCC storage and drying loans.

Appendix table 7b--Balance sheet of the farming sector, including operator households, December 31

Item	1983	1984	1985	1986	1987	1988F
Billion dollars						
Farm assets	1,051.0	949.7	845.4	789.4	813.1	725 to 735
Real estate	801.8	693.7	606.4	554.0	567.2	534 to 544
Livestock and poultry	49.7	49.6	46.3	47.6	57.6	57 to 61
Machinery and motor vehicles	106.2	102.7	92.4	84.4	78.6	78 to 82
Crops 1/	23.9	29.6	23.5	19.1	20.5	14 to 18
Household goods	24.4	26.1	27.8	30.5	33.3	00 to 00
Financial assets	45.0	47.9	49.0	53.8	55.9	00 to 00
Farm debt	206.5	204.4	188.0	166.8	153.3	132 to 142
Real estate 2/	113.7	112.4	105.9	95.8	87.4	76 to 80
Nonreal estate	92.7	92.0	82.2	71.0	65.9	56 to 60
Total farm equity	844.6	745.2	657.3	622.6	659.8	590 to 600
Percent						
Selected ratios:						
Debt-to-asset	19.6	21.5	22.2	21.1	18.9	17 to 20
Debt-to-equity	24.4	27.4	28.6	26.8	23.2	21 to 24
Debt-to-net cash income	519.2	491.7	370.6	298.1	245	230 to 247

F = Forecast. 1/ Non-CCC crops held on farm plus value above loan rate for crops held under CCC. 2/ Includes CCC storage and drying loans.

Appendix table 8--Farm financial ratios: liquidity, solvency, profitability, and financial efficiency

Farm financial ratios:	1980	1981	1982	1983	1984	1985	1986	1987	1988F
Liquidity ratios:									
Household debt service coverage 1/	2.73	2.42	2.43	2.40	2.52	3.10	3.70	4.4	4.9 to 5.0
Farm business debt service coverage 2/	1.86	1.66	1.74	1.70	1.76	2.12	2.47	2.9	3.1 to 3.2
Debt servicing 3/	0.19	0.22	0.23	0.22	0.21	0.18	0.17	0.15	0.1 to 0.2
Times interest earned ratio 4/	2.23	2.57	2.26	1.80	2.72	2.95	3.46	4.3	4.0 to 4.1
Solvency ratios:									
Debt/asset 5/	16.7	18.3	19.7	20.4	22.5	23.4	22.5	20	18 to 20
Debt/equity 6/	20.1	22.4	24.6	25.6	29.0	30.5	29.0	25	23 to 25
Financial leverage index 7/	-0.47	0.16	0.03	-1.12	0.37	0.53	0.72	0.8	0.7 to 0.8
Profitability ratios:									
Return on equity 8/	-0.5	0.4	0.1	-1.3	1.2	2.0	3.6	4.9	3 to 4
Return on assets 9/	1.2	2.2	2.2	1.1	3.2	3.8	5.0	6.0	5 to 6
Net farm to gross cash farm income 10/	11.3	18.4	15.6	8.4	20.8	20.6	24.7	28	24 to 25
Financial efficiency ratios:									
Gross ratio 11/	76.1	77.6	74.9	75.5	75.1	70.3	66.2	64	64 to 66
Interest to gross cash farm income 12/	10.9	13.1	13.9	13.7	13.1	11.4	10.7	9	8 to 9
Asset turnover 13/	15.1	14.7	15.4	15.8	17.3	19.6	21.1	23	22 to 24
Net cash farm income to debt ratio 14/	31.3	29.7	31.6	30.1	30.8	35.3	40.9	48	50 to 51

F = Forecast. 1/ Assesses the ability of farm sector households to repay both principal and interest. 2/ Assesses the ability of farm businesses to repay both principal and interest. 3/ Indicates the proportion of gross cash farm income needed to service debt. 4/ Shows the farm sector's ability to service debt out of net income. 5/ Shows the proportion of all assets that are financed with debt. 6/ Measures the relative proportion of funds provided by creditors(debt) and owners(equity). 7/ Indicates whether or not the use of financial leverage is beneficial. 8/ Measures the ability of farm sector management to realize an adequate return on the capital invested by the owner(s). 9/ Measures how efficiently managers use farm assets. 10/ The profit margin indicates profits earned per dollar of gross income. 11/ Gives the portion of gross cash farm income absorbed by production expenses (claims on farm businesses). 12/ Gives the proportion of gross cash farm income committed to interest payments. 13/ Measures the gross farm income generated per dollar of farm business assets. 14/ Indicates the burden placed on net cash farm income to retire outstanding debt.

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